

Dealer
Survival

COOP'S
SATELLITE
DIGEST



JANUARY 15, 1986

Hurricane Kate
Italian Hotbed
of TVRO



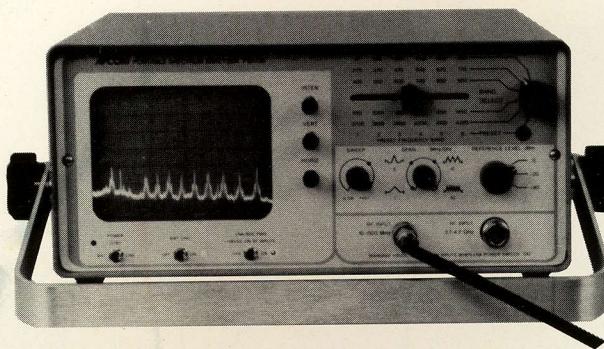
TAKE ALL THE GUESSWORK OUT OF TVRO INSTALLATIONS AND T.I. ANALYSIS WITH AVCOM'S NEW PSA-35 PORTABLE SPECTRUM ANALYZER

ASK ANY TVRO DEALER WHO OWNS AN AVCOM PSA-35 PORTABLE SPECTRUM ANALYZER.

With AVCOM's PSA-35 Portable Spectrum Analyzer you can measure and document TVRO system performance after installation or service. Troubleshoot system problems by observing output signals from LNA's, BDC's, Line Amps and Splitters, and other RF signal components. Measure block system signal balance.

Identify and resolve Terrestrial Interference problems quickly and precisely by displaying offending signals on the PSA-35. Customers can be shown the nature of T.I. problems for clearer understanding.

AVCOM's high performance PSA-35 Spectrum Analyzer becomes even more attractive when price is



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AVCOM'S PSA-35 SPECTRUM ANALYZER BECOMES EVEN MORE VERSATILE WHEN USED WITH THESE NEW ACCESSORIES!

SSC-70 SIGNAL SAMPLER AND CALIBRATOR —

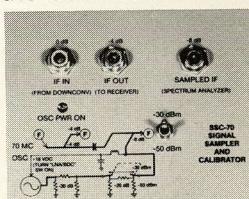
AVCOM's new Signal Sampler and Calibrator, SSC-70, is designed for use with the AVCOM PSA-35 Portable Spectrum Analyzer.

The first function of the SSC-70 is to sample TVRO downconverter IF signals in the 30 to 200 MHz range. The IF signal is looped through the SSC-70 between the downconverter and the satellite receiver. Tuning

voltage present in the IF coax is passed from the receiver to the downconverter unaltered. The IF signal is sampled and is available on the "SAMPLER IF" F-fitting. The PSA-35 Spectrum Analyzer is connected to this port and the IF signal can be accurately measured and examined.

If Terrestrial Interference filters are in the IF coax line, they can be tuned precisely so that video quality is preserved while T.I. is minimized.

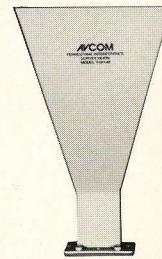
Also an internal oscillator operating at 70 MHz, with harmonics at 140 MHz and beyond provides a quick means of checking amplitude calibration and frequency



setting of the PSA-35 Spectrum Analyzer. Two output signal amplitude settings are available, one at -30 dBm and another at -50 dBm (at 70 MHz). The output level is selected by a front panel switch. The calibration oscillator is powered by the PSA-35 LNA/BDC power through the input connector. A front panel LED indicates when the oscillator is on.

TISH-40 TERRESTRIAL INTERFERENCE SURVEY HORN. AVCOM's new Terrestrial Interference Survey Horn, TISH-40, is designed to be used in conjunction with the PSA-35 Portable Spectrum Analyzer for site surveys.

The TISH-40 Terrestrial Interference Survey Horn features 18 dB gain in the 3.7 to 4.2 GHz range of frequencies. It is highly directional with high gain and rugged construction. Terrestrial Interference sources can be pinpointed quickly and accurately to increase the utility of the versatile PSA-35 Spectrum Analyzer. 1/4-20 stainless nuts pressed into the flange make LNA assembly and disassembly quick and easy.



FOR MORE INFORMATION WRITE: AVCOM, 500 Southlake Blvd., Richmond, VA 23236 or call (804) 794-2500. To order, call, 1-800-446-2500.

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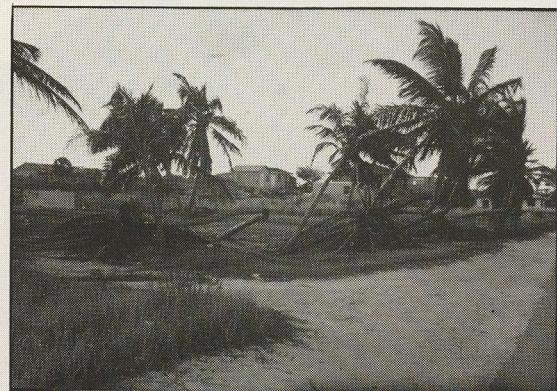
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Our Cover/ TVRO Dealers, the foundation of our industry, have just come through a rough year. Here, dealers attending SVS (Satellite Video Services) training seminar seem anxious and ready to 'turn it around' in 1986.



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President—Douglas G. Brown

Publisher
Christopher J. Schultheiss

Editor
Bob Cooper, Jr.

Assistant Editor
Pat St. Charles

Editorial Department
Karen Miller Sisk
Michael Ledbetter
Allen Teasley

Graphics Supervisor
Mary Ann Stroud-Prevost

Assistant Art Director
Timothy A. Nicholas

Graphics and Lay-up
Douglas L. Stoll
David B. Melton

Typography
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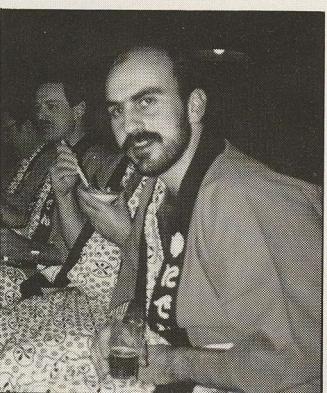
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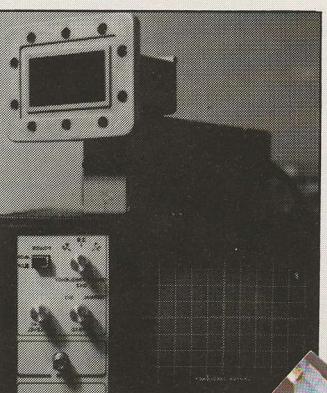
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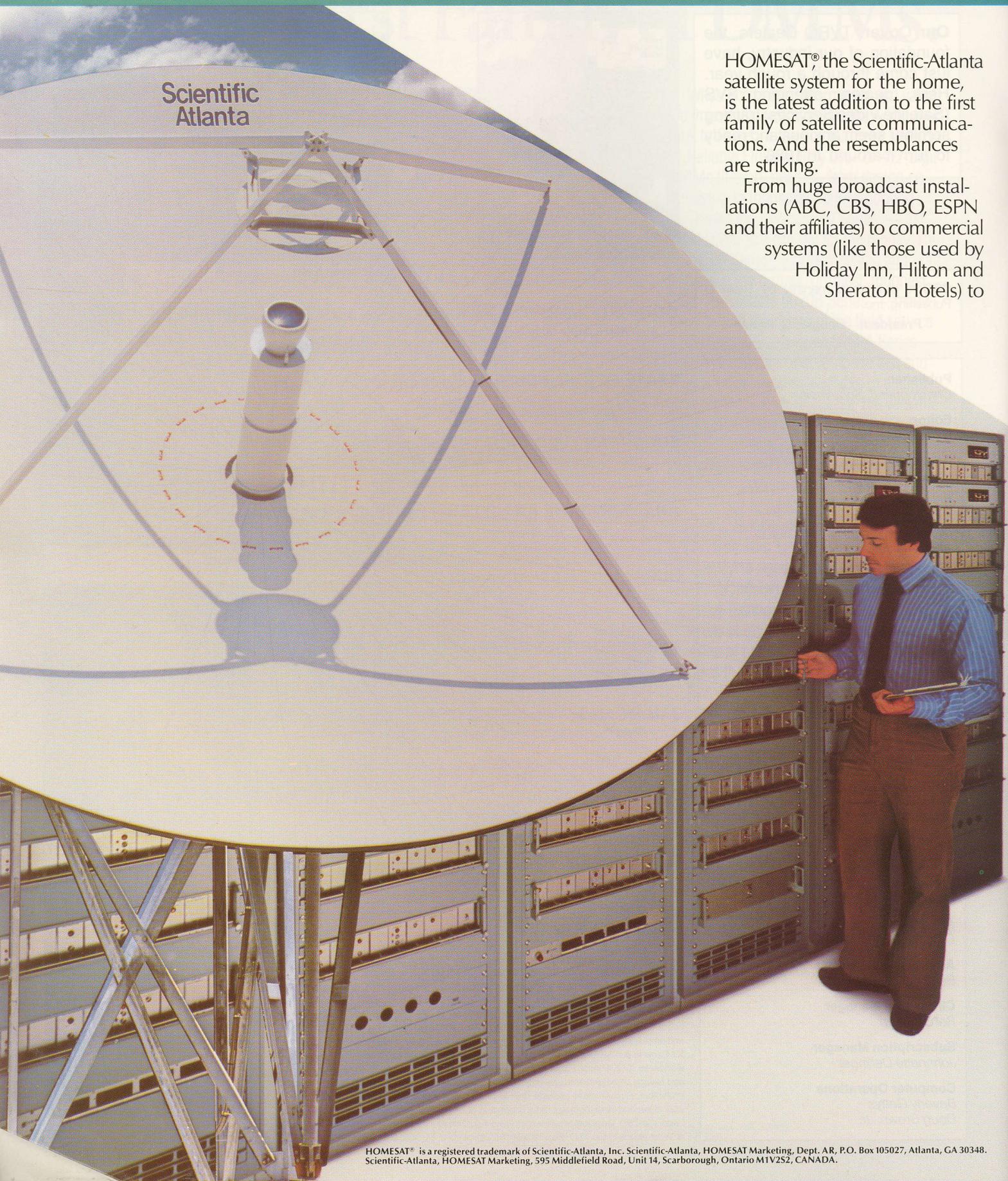


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private networks and now to the home. The generations of Scientific-Atlanta quality and value come through loud and clear in this latest evolution—a satellite system for the home called HOMESAT.

RIGOROUS DESIGN

HOMESAT system predecessors have proven time and again the value of a complete system. Uplinks and downlinks matched for superior performance. All system components designed to play together, to work together as a complete unit.

The HOMESAT system remains true to its roots with the HOMESAT® 800 block conversion receiver and the HOMESAT® 8000 perforated antenna

paired together for unparalleled performance.

MANUFACTURING EXCELLENCE

High volume manufacturing experience is a plus with the new HOMESAT systems. Antennas are mass produced using the latest, sophisticated stamping techniques. And system electronics are subjected to the same quality tests and standards used to maintain performance levels in Scientific-Atlanta low cost set-top terminals and U.S. Government and military contract work.

Standards have to be high where performance is critical. And there are no higher standards than those for HOMESAT and Scientific-Atlanta.

COMPREHENSIVE DEALER SUPPORT

HOMESAT comes to you with a program that gives all you'd expect from an industry leader. Expect free technical assistance,

regional training clinics and co-op advertising programs. Expect extensive support materials including signage, brochures, ad kits and point-of-purchase aids. Expect the program to work harder than any other dealer support program available.

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A factory direct distribution system with Regional Distribution Centers puts HOMESAT products, technical support and warranty service at your fingertips. A fast phone call and faster response can save days and dollars on your balance sheet.

HOMESAT and Scientific-Atlanta. Strong family ties that go back generations. And family traits like quality, reliability and value that are stronger than ever. These are the heritage that HOMESAT systems live up to. These are the traditions that make HOMESAT one of the best home system buys in the industry.

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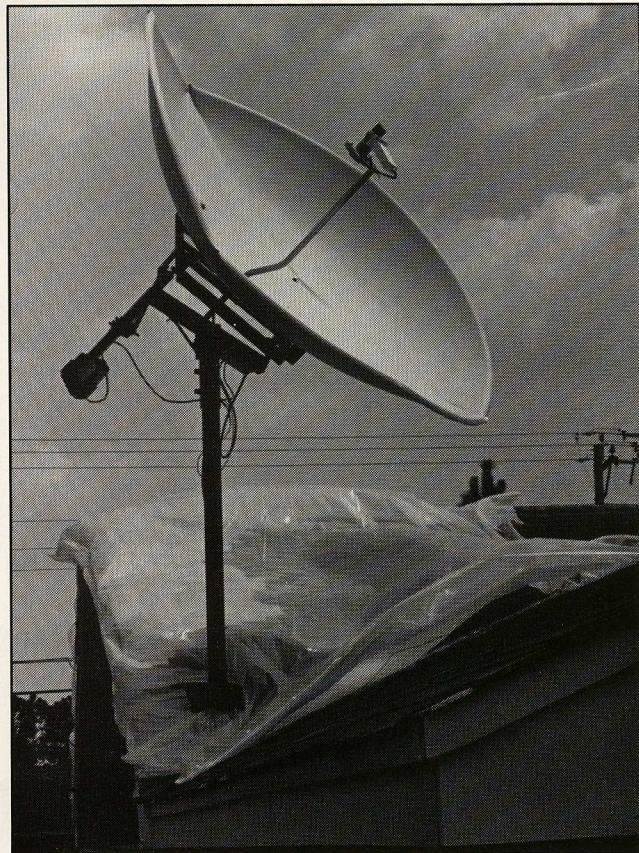
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Coop's Satellite Comments



Aluminum Mesh dish damaged by Elna. In our view, the dish was defective to begin with before the winds blew.



Spun Metal dish was turned into a rejected frisbee by Elna.

Another Hurricane View

Our first look at the effects of a hurricane appeared in the October 15th issue of CSD when we reviewed the reports coming in from dealers along the west coast of Florida after early-September Elena passed over that portion of the world. An extensive report of a much more devastating storm, Kate, as it moved over our own Providenciales test range appears in this issue. There is more.

Nancy Turpin-Sherwood, who is Vice-President of Operations for Odom Antennas, sent along a set of photographs and a story written by a TVRO dealer in Hattiesburg, Mississippi; William L. Geoghegan of Star-Scan, Inc. Bill's story basically was that in his area mesh antennas blew into smithereens, spun metal dishes folded up and fiberglass

dishes "merely bent their pole mounts." After looking at Bill's report and studying the photos he had taken, I think they should all be glad our Kate did not rip through their area.

I share some of the key photos with you here. Let's talk about the mesh dish that lost its feed and much of its surface first. I am not impressed with the method (whatever it may have been) used to attach the mesh to the parabolic (strut) surface. If the screen flew loose but the hub-to-mount right angle plates I see in this photo held together, the screen may have been attached with chewing gum. Those plates should have gone long before the screen came loose. I cannot see

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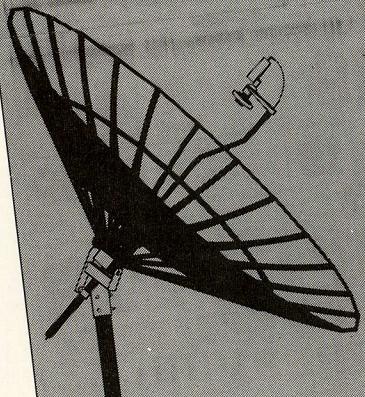
Satellite Television and the Law

With all the controversy surrounding the ownership of Home Satellite Television Systems we feel it is time the Facts were known.

Home Earth Station Use is Legal
Signed into law by the President of the United States, the Cable Communications Act of 1984 states that it is legal for a home earth station owner to view all unencrypted satellite cable programming without payment of any fees. We realize that certain programmers are asking for fees but under this law no fees are necessary.

Satellite Television Provides More Channels
As many as 50 more channels than what cable offers are available on most Satellite TV Systems. Often the same programming can be seen on different satellites at different times. This allows the home earth station user to relax and enjoy television viewing at times that fit into his or her schedule, not vice versa.

Truth About Scrambling
SCRAMBLING WILL NOT HINDER THE FREE OF HOME EARTH STATIONS.
Some cable operators are warning against the purchase of home satellite systems, claiming that scrambling will "make satellite dishes useless." These claims are groundless. Satellite Earth Stations are here to stay. Congress and the President reaffirmed this fact when public law 98-549 was passed clarifying the rights of home satellite antenna owners. The most vocal proponent of scrambling, H.B.O. has already announced that it will serve the home earth station user. So if no scrambling occurs the home owner will have a choice to either subscribe to the service or not. There will always be abundant programming available from other satellite services that have no intention to scramble.



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State of The Industry

Caught Between

Pity the poor chap who entered the TVRO business as an installing retailer in, say, 1982 or '83 or even 1984. He has witnessed profound changes in his marketplace and just when he felt that he knew and understood his business, and could cope with the unusual requirements of TVRO retailing, all of the rules have changed.

"Last year, in October, our shop sold and installed 38 systems. Our average price was \$3,050. This year we sold four in-

stalled systems in October and the average price was \$3,200. I don't understand what has happened!"

The reports have flooded in and they basically say the same thing; the retailing of TVRO has rapidly changed and in just a year the 'established retailers' are a vanishing breed of business person. For many, even a majority, of those who have established successful retailing businesses, their future is in grave doubt.

PROMOTIONAL EFFORT by regional Uniden distributor in southeast was mailed to millions of US homes in target marketing area. Mail featured prominent stand from President Reagan concerning legality of TVRO.

"I don't understand what all of the fuss is. We sold 76 systems in November and my three salesman have more leads than they can possibly follow up on. I wish I could find two more top notch salesman and a half dozen new guys to help with the installations. Business is fantastic!" The other side: upbeat retailers engaging in heavy advertising, carefully selected retailing locations in malls, and high business traffic locations, are reporting more business than they are capable of servicing.

"I know the answer. At least, it is working for us. The first

RESPONSE advertising funded by TVRO distributor (Startech, Inc. of Virginia et al) points out that consumers will have the choice of subscribing to scrambled channels (or not), and, "there will always be abundant programming available from other satellite services that have no intention to scramble."

thing the retailer must do is to stop handling brand names which every other full and part-time dealer in his area is carrying. We found that out when we were handling Drake and later DX. These are such widely distributed products in our areas that customers who shop around invariably end up shopping only for price. I refuse to sell systems for \$100 profit; there is no way I can stand behind the system or service it for that kind of profit! So, I switched to Scientific Atlanta and more recently to Kenwood. I will probably add the USS Maspro SR-3 for the



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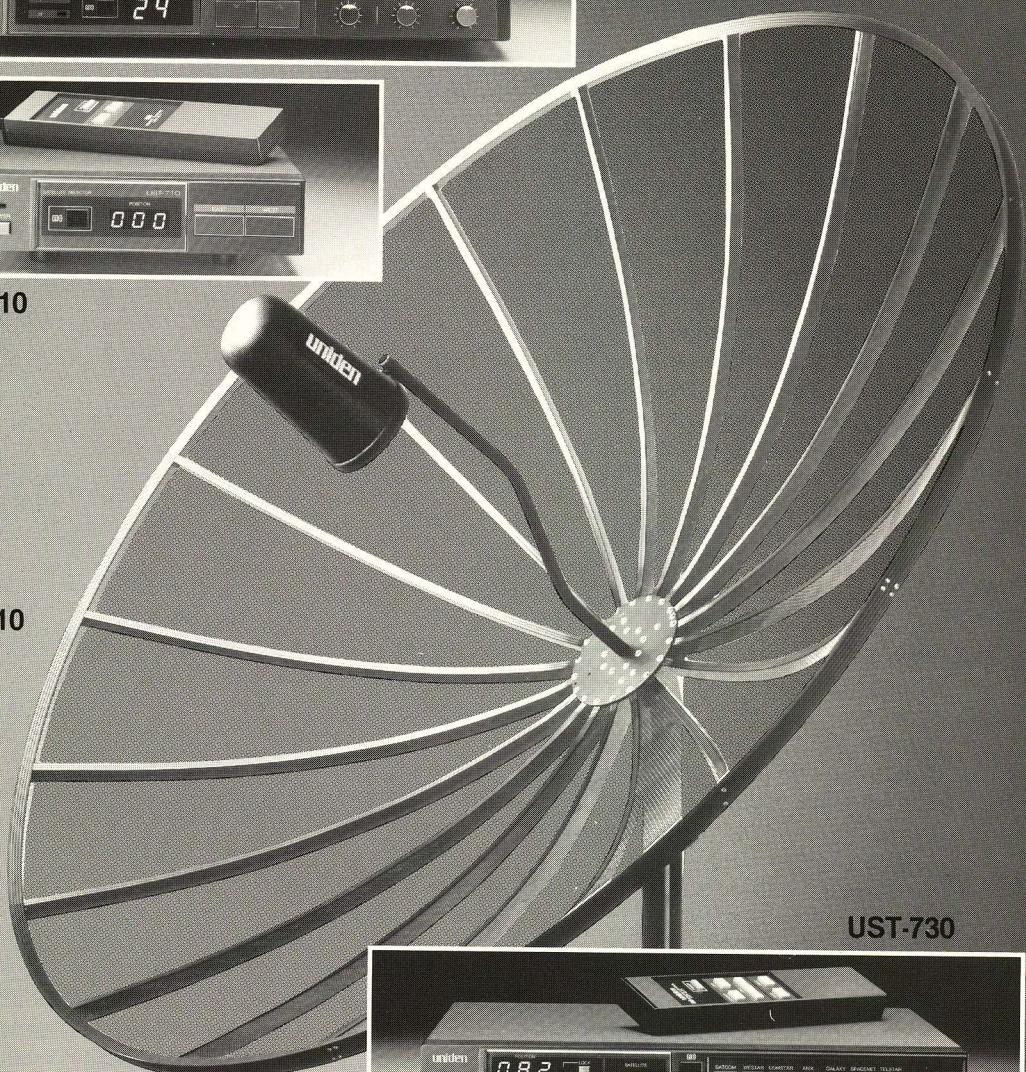
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top-end systems. I want my systems to be different from the others being offered in this area and I have to be very careful to select products which other dealers around here are not carrying. I can sell the different products, but I can't compete with people who don't think they have to make a profit!"

This dealer who is well known in the industry has already survived the latest shake-out in dealerships. He worried through a tough spring and summer and then finally developed his own selling strategy.

The number one story in 1985 has been the great dealer shake-out. Dealers who made up perhaps 75% of the industry product traffic during 1984 found themselves virtually out of business by the middle of 1985. Some say these established dealers were not as established as they thought; worse yet, they were not ready to handle the changes in the marketplace which came in 1985.

"It really started at the distributor level. When Uniden and a handful of others such as STS and DX and Drake became such dominant forces in the marketplace, virtually every distributor in the country ended up handling these products. With sales spiels offered to the distributor salesmen by the OEMs, naturally certain brands got pushed over others. This year's crop of new dealers, whether full-time or part-time, were brought up on a handful of major brand names. They bought what everyone else bought, and then flooded the retail marketplace with these identical packages. When everyone offers the same products, there is price erosion. It is a law of the retail jungle," commented the dealer.

Sales were off in 1985. Nobody is sure by how much, since we have passed yet another year and still have no verifiable measurement system in place to track our growth. The best and most educated guesses suggest this year saw between 460,000 and 500,000 complete systems moved at retail. This is significantly below the early-'85 predictions of 600,000 to 750,000 units. When all of the units are counted, it appears that this will have been a year of modest growth (perhaps 10-12%) over 1984.

The marketplace was badly fragmented during 1985. Price erosion at the retail level was worse in 1985 than in any previous year in memory. Systems that retailed for \$2995 in January were typically going to retail customers for \$2295 in November. Low-profit retail shops and a new influx of part-time satellite dealers were the cause of much of this change. 'Plus installation' selling was another cause.

A number of electronic and high tech retail chains and discounters entered TVRO during 1985. Crazy Eddy (metro New York), Brands Mart, and others primarily interested in selling, not installing, significant volumes of merchandise moved in on TVRO during 1985. Their efforts were experimental; products were sold 'as is,' with the customer arranging for installation on his own. Or, prices were exclusive of installation but the seller would arrange for contract installation. Numerous dealers were tempted with \$300-\$500 contract installation fees during 1985—fees being paid by volume merchandisers who wanted to sell but who did not want the headache of installation or service.

Not all of the mass merchandising experiments were conducted by volume discounters. Burdines, a well-known Florida department store, lent its name to a system packager who, in

turn, offered satellite systems to Burdines customers. Typically, the merchandiser, operating as a contract agent, receives floor space to display the satellite system. But he does little or no training of Burdines personnel; rather, he operates his own telephone selling network using customer (credit card) lists acquired from the department store. The customer believes he (or she) is purchasing a "Burdines Satellite System" when in truth the system has been packaged, is being offered by, and is being sold by a totally unrelated merchandiser who is simply paying the store a commission fee for use of their name. It works, as elated Burdine store managers will tell you.

Big ticket systems are not dead either. In upstate New York, an aggressive swimming pool sales operation headquartered in western New York averaged nearly 100 systems per month all through the fall. The selling price for the 10 foot systems? Over \$6,000 each. The hook? Financing; mid-and long-term financing and a sophisticated direct selling technique that begins with a number-by-number sequential telephone solicitation that grinds through every telephone in the area over a period of a year. Hard work? Of course. But when their systems sell for more than twice the national average and they are among the largest 'dealer operations' in the nation, who can argue with the results?

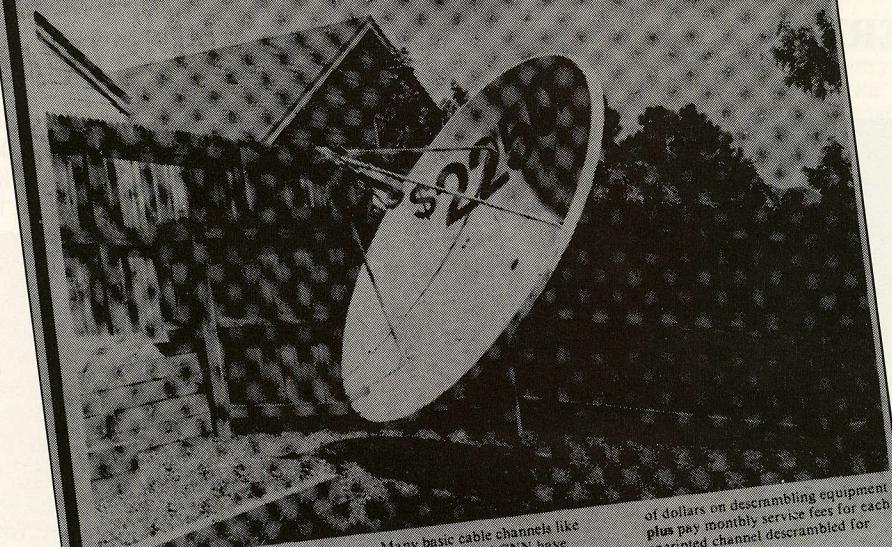
Mom and Pop Have Suffered

For every Burdines that is doing well, there are a dozen 'Mom and Pop' retailers who have felt the sting of near disaster. People who devoted several years and all of their aptitudes and energies to developing a TVRO dealership are on the ropes, reeling, and uncertain what hit them. The cause of their problems is difficult to pinpoint on a universal basis. Scrambling, or fear of scrambling, is certainly one problem. But, it hardly explains the success of Burdines and other retailers who seem to be doing very well in spite of the misfortunes that have hit the more traditional retailers. Here, in my opinion, are the three major problems:

One/ Traditional (TVRO) retailers may have been too slow to adapt to change—product and market attitude change. The strength of the traditional retailer has been his specialized knowledge of TVRO, his ability to answer questions about how systems work, what services are available, and how he can configure a system to suit the individual needs of a customer. TVRO knowledge is no longer difficult to attain; there are three customer-oriented TVRO magazines on newsstands and several of the guide products are also sold there now. In short, the need for entry-level specialized knowledge is now much less acute than it was even one year ago. The traditional dealer is in the same spot as the manufacturer of milking stools was when milking machines were introduced; his time has passed.

Two/ With more customers being knowledgeable, it is more difficult to charge for expertise. System prices have dropped and TVRO systems have become just another commodity. Buyers are now buying features they can understand and appreciate and they usually have two or more sources to conduct comparison shopping. Price, not important in years past, has become the

BUYING A HOME SATELLITE DISH IS COSTLIER THAN YOU THINK.



Before you spend your hard-earned money on a satellite dish you should learn the facts.

Popular premium services like HBO and Cinemax will begin scrambling their signals with highly sophisticated electronic encryption.

Many basic cable channels like ESPN, MTV and CNN have announced their intentions to scramble signals.

What does this mean for satellite dish owners?

In addition to paying several thousand dollars for the purchase and installation of a receive dish, it is estimated that it will cost hundreds of dollars on descrambling equipment plus pay monthly service fees for each encrypted channel descrambled for viewing.

Make your decision based on the facts.

This message is brought to you as a public service by the Florida Cable Television Association.

CLEVER, cable-funded anti-TVRO advertising urges consumers not to buy TVRO because of unknown, hidden costs in TVRO system ownership. Advertisement points up scrambling costs ("hundreds of dollars for descrambling equipment and monthly service fees.")

number one item on most customer minds. Established dealers, unwilling to accept that their expertise is no longer as needed, have been unwilling to re-price their systems accordingly.

Three/ Fear of product is gone. TVRO was black-box electronics two years ago. Customers needed the hand-holding assurance of the knowledgeable dealer before, during, and after the sale. Designers have removed much of the mystery and much of the 'black magic.' This, coupled with easier access to basic TVRO information in consumer magazines and reference books, has improved the customer's confidence level in the hardware itself. In short, the dealer's importance is no longer an essential ingredient in a system sale. That's tough for an old-line and established dealer to accept.

And Scrambling

Scrambling talk has hurt TVRO sales. Scrambling itself, to date, has had minimal effect on sales. The cable people have clearly won this battle because they were intelligent enough to play on people's basic fears.

"I feel sorry for those people who paid \$3,000 for a home dish system." You wonder why anyone with more than 100

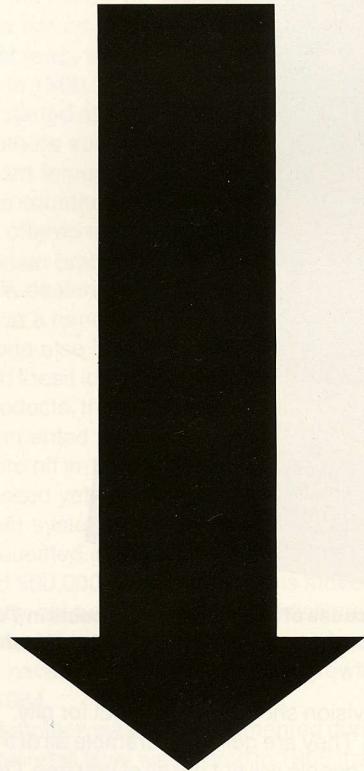
channels of television should be an object for pity.

"Scrambling. They are going to scramble all of those channels; those poor people will not get all of that free TV anymore. They just wasted their money buying one of those satellite dish things," is sometimes overheard.

Attitudes concerning the 'threat of scrambling' are abundantly clear. TVRO is not a mystery anymore. People understand TVRO. Most people would like to have TVRO. Exposure such as the 20/20 program did that for us during 1985. Unfortunately, 20/20 was months too early for the big fall selling season. Between the late May exposure of 20/20 and the months of September/October, the cable people got their act together. Newspaper advertisements, run in hundreds of papers from coast to coast and paid for by consortiums of cable operators, clearly warn consumers NOT to buy TVROs. The advertisements have had dramatic impact on consumer attitudes about TVRO. Nothing else has even come close to the effect this has had on the sale of new TVRO systems. Cable has TVRO-retailing on the run and they know how badly it is hurting. Cable intends to keep the pressure up and they are winning this battle.

Not all TVRO retailers are taking this attack lying down, but the probability that consumer attitudes can be turned around

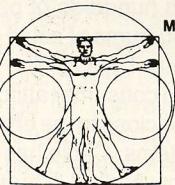
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"The TVRO Marketing Source"

by a counterattack from TVRO newspaper advertising is uncertain. In southern Florida, for example, nine dealers have chipped in \$200 each to sponsor a series of 'truth ads.' These newspaper ads will attempt to convince people that cable scare tactics are untrue. Cable operators will certainly escalate this battle and the winners here may turn out to be the newspaper advertising salesmen. The public, at best, will be confused. At worst, they will find the TVRO advertisements unbelievable.

Distributors such as NSC and SVS are organizing their own retailers into advertising cooperatives. The distributors are creating special newspaper and radio advertisements at their own expense which list dealers in the regions served by the papers or stations who are a part of the 'think TVRO' campaigns. In Virginia, Startech Incorporated launched a similar advertising campaign of its own, backed with cooperative advertising dollars received from Uniden. It worked; Startech dealers reported instant increases in store traffic the very day the full-page newspaper ads appeared.

And Aggressive Selling

Perhaps the most outstanding job of salesmanship in the satellite field this past fall occurred in the southeast where Uniden's master regional distributor literally forced traffic into dealer showrooms. The distributor, savvy from decades of experience in the home electronics field, put together his own promotion for (Uniden) TVRO systems. Several million pieces of direct mail were created and mailed to consumers all over Florida, Georgia, and southeastern Tennessee. This mail explained TVRO systems and urged consumers to stop at their local dealers to register for a group of prizes. A 1986 Corvette, a complete TVRO system, various in-home monitors and receivers, and (Uniden) cordless telephones were awarded. Consumers received free (Uniden) T-shirts merely by stopping at the specified dealers to register for the prizes being offered.

It worked. Participating dealers (nearly 100 in the three states) saw their retail sales increase by more than 20 systems each during the contest period. They averaged several hundred sales leads to be followed up on after the contest period. Best of all, the promotion cost the dealers nothing. Uniden co-op funds received by the distributor handled the whole promotion.

"The dealer is going to have to decide whether he wants to dedicate his life to TVRO or go fishing. There will be no half-way involvement in TVRO retailing by this time next year. The day of the part-timer is rapidly coming to a close," Uniden's Bill Stark said, now up to his elbows in a super-sophisticated marketing program which Uniden dealers will first learn about in detail during March.

"I asked myself what will separate successful dealers from the guys who struggle to stay alive in 1986? I made a list of what consumers want when they shop for a TVRO and I made a list of everything the consumer expects, and finds, when he walks into a store to buy a big-ticket projection TV or a home entertainment package. Then, I put the two lists together and worked out the shortcomings of existing TVRO dealers. Our marketing program in 1986 will attempt to close the gap, putting the dealer in a position to survive by forcing him to deal with volumes of customers. We want him to accept that if he

Home Satellite TV Systems just never looked so compatible.

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PATENT PENDING

does not average between 12 and 25 systems per month, every month, as an absolute minimum, he might be better off fishing."

Uniden's program, for competitive reasons, will remain a well-kept corporate secret until late February. Uniden distributors, undergoing something of a shake-out on their own, will get the word first. Dealers attending the STTI/SPACE show in Las Vegas during February 19-21 will get their first opportunity to study the totally new Uniden approach to marketing.

Basically, here is what we anticipate seeing from Uniden in 1986. Remember, Uniden ended the year carrying more than 50% of the industry's product volume, so what Uniden does in 1986 will have a serious impact on how all of the remaining TVRO manufacturers approach their marketing during 1986.

1) We expect to see Uniden dealers selected, almost by invitation. A dealer is going to have to prove that he has the ability to handle significant volumes of equipment. Uniden will help, we expect, by:

A) Providing the first national training programs for dealers designed to certify dealers for in-shop repairs on receivers and accessories.

B) Providing the first system-designed, specialized test equipment for qualified dealers, created to simplify installation and bring system trouble-shooting techniques to all qualified dealers using newly created test equipment and procedures.

C) Possibly allowing dealers to offer virtually universal consumer financing of TVROs, with exceptionally simplified credit approval procedures.

D) Possibly sending large quantities of point of sale literature, display placards, banners, and other promotional materials.

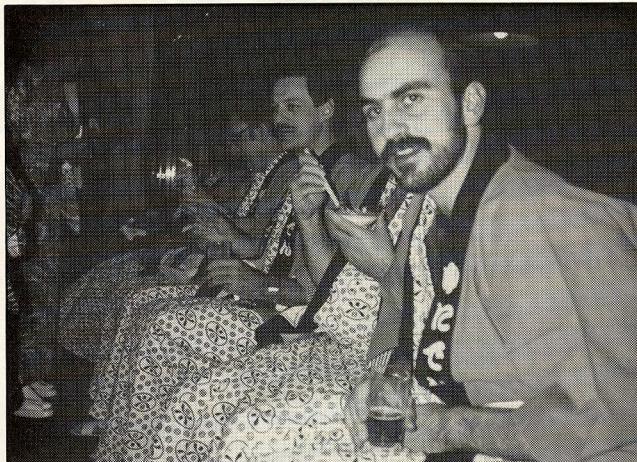
E) Possibly supporting dealers routinely, with a full year's advance scheduling. Regional and national consumer advertising might be built around specific selling events scattered throughout the year, including consumer contests designed to bring customers into stores handling Uniden TVRO system products.

F) Allowing distributors to universally offer some type of floor planning to dealers, as a way to promote volume discounts and add to the dealer's ability to handle large scale promotions sponsored both by his distributors and Uniden.

Uniden's Bill Stark points out that: "We are convinced that he cannot survive if every part-timer in his town is offering the same (Uniden) products. There has to be some degree of product exclusivity. At the same time, we need volume in order to keep up our pricing and promotional efforts. If we are going to cut back on who we sell to, then it is obvious that if we do away with 50% of our present retailers, those 50% who remain are going to have to increase their volume. The only answer here is that we have to help these retailers we keep to sell more products."

The hypothesis that many dealers buying four to six systems per month may be counter-productive is now quite well accepted. Other suppliers, such as STS and Luxor, have come to similar conclusions.

"We would far rather have 2,000 dealers selling 25 or 30



SVS's GARY KISTINGER (right) captained his distribution firm to a profitable leadership position in 1985 by listening closely to dealer needs and problems.

systems each per month than to have 6,000 dealers each selling 6 or 10 per month. This year (1986) will be the year of the great nuclear fall-out. Those who remain are going to have to convince us that they are serious about TVRO and that they want to still be here when the shake-out is over. We want to deal with the winners, not the losers," commented Bill.

Distributor Role

Not everyone believes that the distributors now in business will still be here in another two or three years.

"There have been some real empire builders in the distributor business. However, I believe 1985 was the last year of major growth. Look at firms such as Hoosier, which is growing from one outlet in 1985 to more than ten by year's end. That has had to significantly tax their resources. How many outlets can a real distributor operate profitably? There just are not enough good distributor management people available in this business to support never ending expansion. I look for major distribution-level shake-outs in 1986, especially if the forecasted loss of small-time dealers buying four to six systems per month occurs," concluded Bill.

The fear here is that the real backbone for distributor expansion has been the relatively small dealerships who buy in small quantities, usually only after making a sale, and who pay top dollar for their TVRO systems. If the anticipated reduction in part-timer dealerships occurs during 1986, along with a consolidation of remaining dealerships, business for all of those distributorships could dry up in a hurry.

"I don't expect many of the existing distributors to still be around in 1988, maybe even 1987," said a major OEM sales executive. "Look what Uniden has already done with their Florida-based distributor—an old line TV distributor who is showing us what promotion and distributor support is really all about. You cannot expect to do that kind of job with offices scattered all over the country. I really expect to see strong, regional distributors by 1987 and they will largely be the people who have an established base in video and audio distribution. The same thing that happened to specialty dealers in 1985 is going to happen to specialty distributors during 1986."

Perhaps, but Gary Kistinger of Satellite Video Services is not so sure.

"We are already seeing a consolidation of product line distribution from some of our product sources. M/A-Com, for example, decided to take most of New England away from SVS and hand it to an established TV and audio distributor. That hurts when it happens, but it helps us focus on what our ultimate place may be in TVRO. We have to provide services which the old-line TV and audio distributors may be slower to provide. Our dealer classes, for example, routinely attract upwards of 200 dealers each month. Nothing has more priority around here than helping our dealers get educated on the special techniques required to sell, install, and service TVROs. We fully understand that a TVRO dealer, to survive in 1986, is going to have to be two to four times smarter than a dealer had to be in 1985. I think we can survive as a distributor if we stay in close touch with the needs of the dealers and constantly fine tune our own programs to incorporate those needs for the dealers we service," stated Gary.

Kistinger's SVS has been a bright spot in an otherwise drab distributor year. The firm had significant sales growth in 1985 versus 1984, partly due to the opening of new outlets. A surprising new market for TVRO is in the inner boroughs of New York City, where cable television has been slow to materialize.

"We began to notice that an increasing number of our dealer class attendees were coming up from New York City," he reflects. "We asked questions and found out TVRO is suddenly very popular in the city. We'll have to react to that fact as a distributor if interest continues to grow."

NSC's Ron Bruce is worried about the image of TVRO in the marketplace. "How can we expect to win this battle with cable if we cannot conduct our intra-industry affairs in an ethical manner? I am concerned about our image in the marketplace. Customers looking at TVRO go from one dealer to another asking basic questions about scrambling or system operation. Every dealer they talk to gives them a different answer. If we cannot get our own stories straight or if we cannot learn what the real facts are and then be honest enough to relate those facts (concerning scrambling et al) to the customers in an honest manner, what possible chance do we have in the marketplace to win consumer confidence? The erosion of retail sales this summer and fall is attributable, I believe, to an erosion of consumer confidence in our product and our integrity. We need to clean up our own act if we expect to beat cable!"

NSC has seen business fall off during the latter half of 1985. It has hurt.

"We have tried to do our own careful selection of dealers. It is tough to make a decision about every dealer you sell to as to whether he has the determination and potential to be a survivor. You want to help dealers that you think are really dedicated to TVRO. And in small ways, I suppose you want to discourage those who seem to have the wrong attitudes. In effect, we find ourselves in a position of turning business away because we are making judgements about a fellow's or gal's ability to survive. But if a distributor has no integrity or if he sells to everyone who comes into the outlet, what kind of support is he giving to his industry? This has been a tough year to be put in that spot, having to decide who to help and who to send on their way to somebody that doesn't seem to care about the future of the industry. It will probably be no better in 1986," said Ron.



NOT a laughing matter/NSC's Jack Hannah (right) feels industry is still fighting technical incompetence at the dealer/installer level. One OEM who has tried to correct that problem is Paradigm's David Johnson (left).

NSC's Jack Hannah, in charge of the firm's extensive technical department and responsible for both product evaluation and dealer training, is concerned about the dealer technical level.

"Unfortunately, too many of the dealers are not plugged-in technically. We see a great deal of incompetence and it repeats itself over and over. The manufacturer who addresses dealer training in a thorough manner is going to do very well. The dealers want to learn if the training is presented to them in a useful format and in a practical way. I know the industry's image is being hurt by people who simply do not know how to build a dish or make a system track. Nobody should be selling this stuff if they can't handle the basic mechanics and electronics," commented Jack.

The SPACE Dealer Certification program continues to be abused in the marketplace. In spite of reasonably good crowds at trade shows and for televised sessions*, the general attitude among many dealers is that the courses cost too much, teach too little, and take far too long to complete as a series for the coveted certificate to be issued. At least a few manufacturers plan to 'amplify' the SPACE training during 1986 by making televised training courses universally available via satellite. Even SPACE has changed their mind about their televised courses.

*(SPACE recently decided to unscramble their televised courses during 1986, after transmitting the 1985 courses encrypted using the Oak Orion system. SPACE will now police the course program by managing the testing procedure in a manner which assures that only those dealers who have signed up for the courses receive study guides and participate in the testing sequence. The scrambled transmissions were universally unpopular in the TVRO trade.)

The 12 GHz Challenge

In an industry previously driven largely by technological innovations and new programming sources, the '85 year was a revelation. No new, significant programming sources appeared during the year and, with the possible minor exception of slightly more sophisticated receivers, no recent technology drove the marketplace to new sales highs.

"State of the art is here, now," observes NSC's Jack Hannah. "We had new major changes in product quality and features every few months for five years; now we are in a slow refinement period. I don't look for that to change significantly during 1986."

Nineteen eighty-five will probably be best remembered in technical manuals as 'The Year Of Block Conversion'—a year during which the BDC products came into their own. It was, unfortunately, a year when no single, clear-cut choice for block IF emerged. The battle between 950-1450 MHz and 400-900 MHz seesawed back and forth all year long. Because of the Uniden/Drake/DX commitment to 950-1450 MHz, the volume remained with the higher block IF. But, by actual receiver model count, inclusive, of course, of many additional smaller-volume receiver suppliers, the 400-900 MHz region IF was a slight winner.

"We see no winner here for another year yet," observes Sat-Tec's John Ramsey. "Our new receiver will use the 950-1450 MHz region IF even though our present best selling ProStar XR-1 uses 430-930 MHz. There is simply not an apparently better choice and there are sound arguments in favor of both selections. Certainly, having to keep up with this field battle drives up prices for a receiver supplier such as us. And ultimately, the dealer and the consumer pay that additional cost. It is a shame this cannot be resolved."

If the IF choice cannot be resolved, it may have something to do with the slowness of the next most popular band (Ku or 12 GHz) to take off. Nineteen eighty-five was supposed to be the start up year for 12 GHz. And in Europe, it was. (Though it was the FSS 11 GHz band that started up rather than the DBS 12 GHz band). This did not happen in Japan (where the first 12 GHz bird lost two of three satellite transponders only weeks after orbit, and shut down the test and sales programs planned) or in the United States.

"I think the key will be RCA's Ku-1 satellite. Their first Ku bird popped into orbit without any major (known) hitches. That bird was pre-sold to the broadcasters and networks. Now, with Ku-1 heading for orbit, we may see some interesting uses proposed that will have a direct bearing on the 12 (11) GHz world here in North America," stated John.

Rumored for several months, a collection of key cable television programmers have been trying to package a group of service channels (between 8 and 12 such channels) into a single, scrambled package. The concept is that with three to four foot dishes capable of being sold and installed into urban and suburban backyards all over North America, the cable industry, through a firm such as TCI (major cable MSO), could offer all of these services for, say, \$30.00 a month. An entirely cable-controlled backyard TVRO industry might evolve.

"Their additional costs for this would be minimal. If TCI, for example, were to package HBO, Showtime, Cinemax, The Movie Channel, ESPN, CNN, WOR, CBN, and a couple of others together and offer this package for, say, \$30.00 a month to rural and urban America (through the local cable firms), it would be like subscribing to premium cable without the wires. The M/A-Com Videocipher system will work just fine for this service and, with no home hardware in place to start with and no distribution in place to battle with, they could afford the start-up time required to make this work the way they want

it to. That means they would control it from the start and control every aspect of it," added John.

It is more than supposition to say that the plan originated with HBO more than three years ago and has received serious, quiet study for most of the interim. It points up the deliberate, long-range planning which cable leaders are committed to in the TVRO (growth) area.

"Home satellite systems are merely extensions of our service lines," suggests the fiercely pro-cable executive. "It is our right, a right we fought hard for before Congress, the FCC, and a myriad of state regulatory agencies. We own that programming, directly or indirectly. Home satellite systems are a wonderful innovation, but can no longer be built on a foundation of misappropriation; home TVRO is taking our programming and selling it. Sooner or later, we will win this battle. You guys are wrong, dead wrong. You watch; there will be a TVRO, alright. That is not the question. It is merely a question of who will control it."

That is, of course, the question. Nearly 1.5 million US and Canadian homes do have TVRO and many millions more will ultimately have the benefits of TVRO. The future of the home satellite system is not in doubt. Who will sell the equipment, and more importantly, who will fuel the system with the programming? That is the question. Cable remains convinced of their rights in this area. TVRO executives are less convinced of their rights.

"SPACE has been a terribly effective trade organization; I hand that to the group. But their emphasis has been too narrowly defined. I think they made a tactical error by concentrating solely on the legal aspects of TVRO rights. There should have been a much bigger and more coordinated effort to convince the public that cable should not control all software programming. I think there was a 'time window' when an anti-trust suit filed on behalf of the TVRO users would have attracted maximum attention. I think that time window may have passed. I'm not so sure cable's role in controlling program distribution can be diverted now," said an attorney who has watched with considerable interest as the TVRO legal position has unfurled. His firm represents leading cable MSOs and their TVRO file fills several cabinets.

"We are in a difficult position; they do own the programming. It may ultimately boil down to a copyright issue. Cable went through a similar period of disarray in the late 60s and 70s. Everyone thought that cable, the technology, was good for America. Even the broadcasters, then the arch enemies of cable per se, agreed the technology was proper. The battles that raged in Congress between cable and broadcasters (and the battles fought all the way to the Supreme Court), were not a question of cable's right to exist, but rather who would control cable. Do you notice who ultimately ended up controlling cable?—largely the broadcasters. It's the same kind of issue with TVRO. There will be a satellite backyard dish business. Who controls it—that is what counts," suggests an astute TVRO manufacturer with a background in cable.

Cable was on a roll in the early 70s. Two separate Supreme Court decisions ruled that cable had rights in the program distribution area, rights that kept cable from being liable for copyright payments to broadcasters or others. The Supreme Court decisions were very clear. Congress and the FCC

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RON BRUCE of NSC believes that consumer awareness of what TVRO is all about needs more emphasis from SPACE.

reacted to those court decisions by simply writing a new law—a law that brought cable into the copyright payment fold. The new copyright law changed the stature and direction of cable for all time. Indirectly, it was this copyright law that sparked today's satellite distribution of programming for cable.

"I expect TVRO's efforts to gain favorable legislation for ex-

panded viewing rights to fail. The ultimate TVRO solution? Some scheme that grants private TVROs the right to view satellite programming, but with an automatic copyright payment scale in place. TVRO is outside of the normal venues of commerce. An industry built upon appropriation of someone else's property cannot long endure in a nation of regulated commerce. It will come down to paying for programming and nothing else will matter," suggests the cable executive. (Note: Readers are directed to Coop's Comments for this month and an analysis of a TCI marketing plan for home TVRO.)

The Year Ahead

There is far less optimism in TVRO as the industry begins year six of organized retailing of home systems. The acceptance, unwilling perhaps, that the industry is being driven by legal and programming problems while at the same time the dealer foundation is being ripped apart by uncontrolled product distribution has cast a cloud over the near-term future of the industry.

Dealers will struggle even harder to survive in 1986. They will find more and more competition from mass merchandisers, discount houses, and established retailers. They will also find the distribution chain changing favor of greater brand identity for leading products. Many dealers are already reacting, shifting their emphasis away from low-end and even middle-end packages in favor of doing fewer systems limited to top-end packages. They have to do this to sharpen their competitive edge, where their strengths remain. Systems requiring extra receivers, unusual remote control schemes, or non-standard antennas offer the specialist dealers an opportunity to squeeze out another year or two of sales activity.

Programming rights and programming distribution seems certain to dominate the field in 1986. The issues are not yet clearly understood and hardly well defined. Most expect another busy and expensive year of intense legal activity for TVRO. The answers, when they come, will be hammered out through negotiation and compromise. Cable is approaching these ultimate negotiation sessions from a position of strength; TVRO is not.

Ku-band activity will depend almost totally on the sincerity of some cable consortium to field a multiple-channel dish service; probably on the RCA Ku-1 satellite. Even if the plan turns into an operating system, it will not be a boom to TVRO dealers, since the programming will be scrambled almost from day one and the distribution of the hardware and the programming rights will be controlled totally by cable interests. If cable can make an 8 to 12 channel Ku-band service 'fly,' and C-band services are scrambled according to present announcements, the long term viability of C-band 'DBS' (or C-band direct—CBD as we penned two years ago) may be in some jeopardy. The nature, even the make-up of TVRO may be in for a significant change before 1986 if the cable sponsored Ku-band distribution service kicks off.

The industry is in a state of considerable turmoil. There are no easy answers or even well defined questions. The challenge for 1986, for many of us, will be to survive until 1987.

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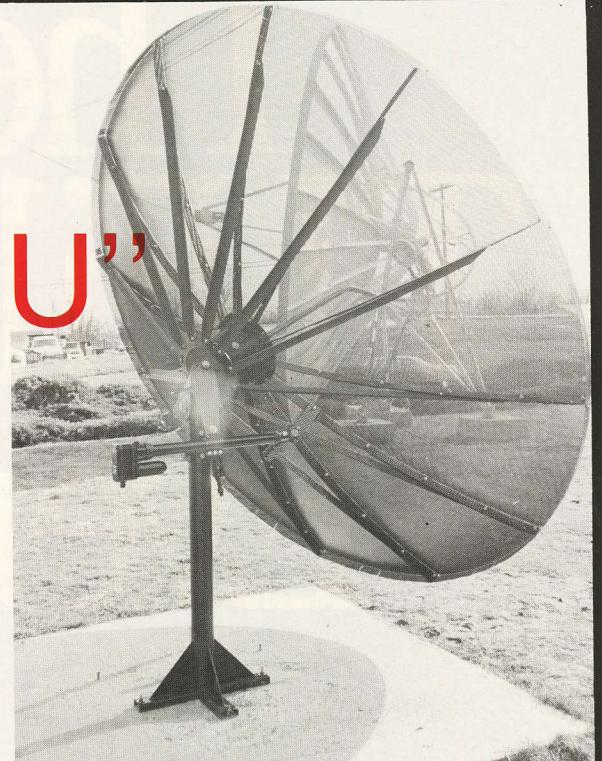
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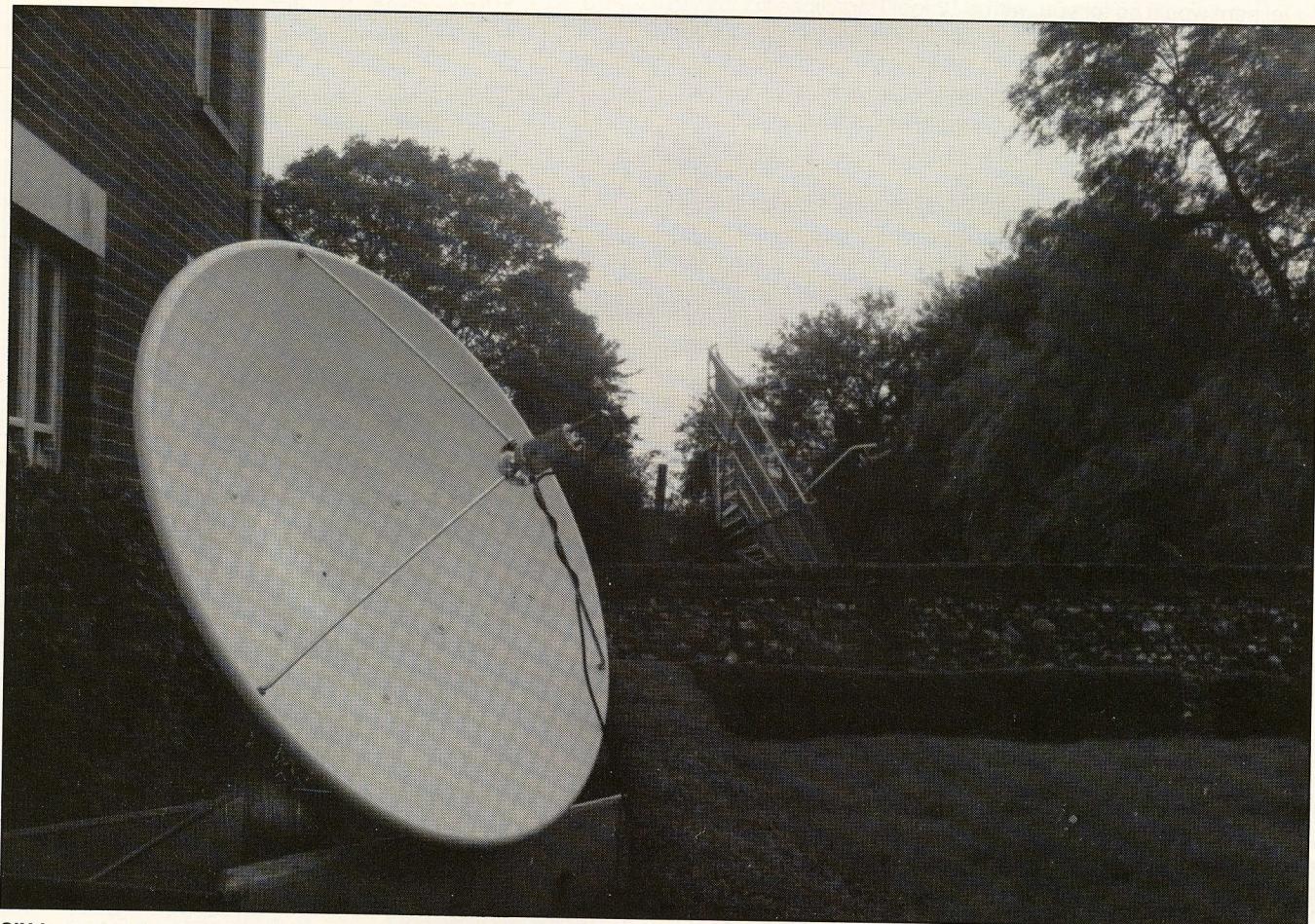
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European TVRO

by William Bruner



SIX foot spun Ku-band dish (foreground) and familiar 12 foot Paracclipse (background) provide two-band reception for the author. Commercial system sales are for 11 GHz terminals only, typically utilizing 5.5 or 6 foot spun dishes and DX electronics.

Over There

The European TVRO industry, as CSD has reported through the years (most recently, see CSD for July 1985) has never been particularly attractive for either American product builders nor for our technology. The 4 GHz or C-band market never really started. First, because of a lack of high EIRP satellite signals into the region, second because of the lack of attractive programming, and third, a complicating factor has been a restrictive set of country by country regulations which inhibit or actually prohibit private TVRO terminals.

This past year, a couple of new 4 GHz feeds, operated largely by or on behalf of the American military stationed in Europe, has brought first time live network service from day time portions of CBS, ABC, and NBC plus a generous sampling of CNN. Even those two channels have not attracted great interest although a newer European Ku-band service has proven to have the type of program appeal and signal levels which may one day foster an exciting and even profitable home TVRO industry.

This writer has been an American serviceman stationed in

the UK for several years. I left the USA just as the first wave of the great American TVRO experiment was getting underway, and I left after already becoming hooked on owning my own TVRO. I toyed with being a dealer in TVRO while still on US soil and owned one of the first terminals in the northeast as a private individual. You can imagine my consternation when, upon arriving in the UK nearly five years ago, I discovered there was no equivalent service in place!

I would, however, transport a Paracclipse 12 foot dish to my UK home and my tried and true Washburn (Earth Terminals) receiver and, together with an array of electronics which would later include a half transponder bandwidth filter, I would attempt reception from a number of satellites spraying extremely low EIRPs into the UK and most of Europe. The parallel here would be for you, with a 12 foot Paracclipse in Ohio, to attempt to watch the Russian Gorizont service from 14 west. Or, with a 3 foot dish in Miami, attempt to watch Galaxy 1. In short, there was not much signal to start with, and I kept at it primarily because it was a challenge and because it gave me an opportunity to stay up to date with direct television news and sports coverage from home.

I never lost faith that one day it might turn into a profit-making venture although my wife did not share that optimism. English back and side yards, by American standards, are frighteningly small. A 12 foot dish in a garden actually meant that we wouldn't have a garden, which is a rightfully considered deterrent to TVRO as we know it in North America for many, if not most, European homes. When God was creating his master plan, he put a large number of people in a small amount of space all over Europe. He also gave people a fierce determination that no matter how small their lots, they would defend to the death their right to live totally alone on those lots. That simply means that anyone who dares think about sticking an unsightly dish in a position where it can be seen by a neighbor had better think twice. A 12 foot (or even a 6 foot) satellite dish would quickly be stoned by the neighbors here, assuming you even got it above ground and into view. Yes, you have zoning regulations stateside but they are mild in comparison with the paperwork and total lack of approval typically granted by English (and I understand other) residents.

Still, in spite of all of this, I did manage to install my 12 foot Paracclipse to watch an occasional football game or news broadcast through the years. The service came through the AFRTS channel from the original Intelsat 1 west satellite. This was an older IV series bird which Intelsat had dedicated to a very low power operation. AFRTS, some American network feeds (at lower-than-AFRTS levels), and the occasional other video signals went through 1 west. Towards the end of the 1 west bird's life earlier in 1985, the station-keeping fuel was about to run dry so the Intelsat people allowed the bird to wander quite a bit north and south of the equator. That meant that in addition to being weak, it was out of my dish boresight a fair part of each day and always moving in a figure eight pattern.

What was a bad situation got steadily worse through 1984 and 1985. I finally realized that I was never going to actually sell a TVRO installation to anyone. I loved to demonstrate the terminal and I would make the usual statements about dish size and how a larger dish would bring in better pictures. It was obvious to most that a 12 foot dish was all I was going to put in my garden; very few people I demonstrated my system to

Department of Trade and Industry Wireless Telegraphy Act 1949	
Television Receive Only Receiving Equipment (TVRO) Licence	
Date of Issue: 3 July 1985	Licence Number: 9/0006
Fee on Issue: £10	
1 This licence is issued by the Secretary of State for Trade and Industry to	
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for the purpose of Section 1 of the Wireless Telegraphy Act 1949 and is subject to the terms and conditions which appear below	
a Installation	
The licensee may install at Lynton House, Ixworth Thorpe, Suffolk IP31 1QP	
wireless telephony apparatus ("the apparatus") designed for the exclusive purpose of receiving television or sound radio programmes which are transmitted by means of an active satellite transponder to an antenna and associated receiving apparatus which operating together are designed to receive and process such programmes for ultimate presentation on a television or screen or through a radio loudspeaker or earpiece.	
b Use	
The licensee may use the apparatus, (whether or not its use for that purpose is dependent on the use of additional equipment in conjunction therewith) for the purpose of receiving or attempting to receive television or sound radio programmes forming part of a programme service being intended for ultimate reception by members of the public or by any restricted group or audience.	
2 Conditions	
This licence is issued subject to the following conditions:	
<ul style="list-style-type: none">The Secretary of State will not seek to ensure that either reception or reception free from interference will be possible throughout or at any time during the continuance in force of this licence.The licensee must ensure that the apparatus has been designed and is installed, maintained and operated in such a way that it does not cause any harmful interference with other wireless telephony.	

UK TVRO license/granted July 3 to author. Reverse side says license is not a substitute for having obtained copyright clearance for any programs received. That issue is still not sorted out in the UK.

could have even managed a dish that big.

It all changed in May when the Armed Forces began a second feed using a more powerful transponder. This service, called SEB-TV, is custom designed for a half dozen American bases located in Italy. The signal level on this transponder was actually noise free when I installed a bandwidth restricted IF filter on the Washburn receiver. Moreover, the SEB-TV service was deliciously programmed with live American soap operas in the daytime; even my wife, long isolated from the American soaps, found an entire new interest and degree of understanding for satellite TV. That was the good news; the bad news was that the SEB service was still on the same ailing 1 west satellite which continued to move north and south of the equator in a pattern that required antenna declination adjustment every few hours. At least now we had something to adjust to!

In mid-year, the Intelsat people heard my prayers and the old bird at 1 west was replaced with a newer satellite which had the full rated power. Now I had a stable signal source and even the AFRTS feed came up to within 1 dB of full threshold on my Washburn receiver when I use the 15 MHz IF bandpass restriction filter to narrow up the passband. (Strangely enough, the SEB feed is now slightly weaker on the new Intelsat bird whereas previously it was considerably stronger than the AFRTS main feed.)

All of this turned out to be more academic than practical,

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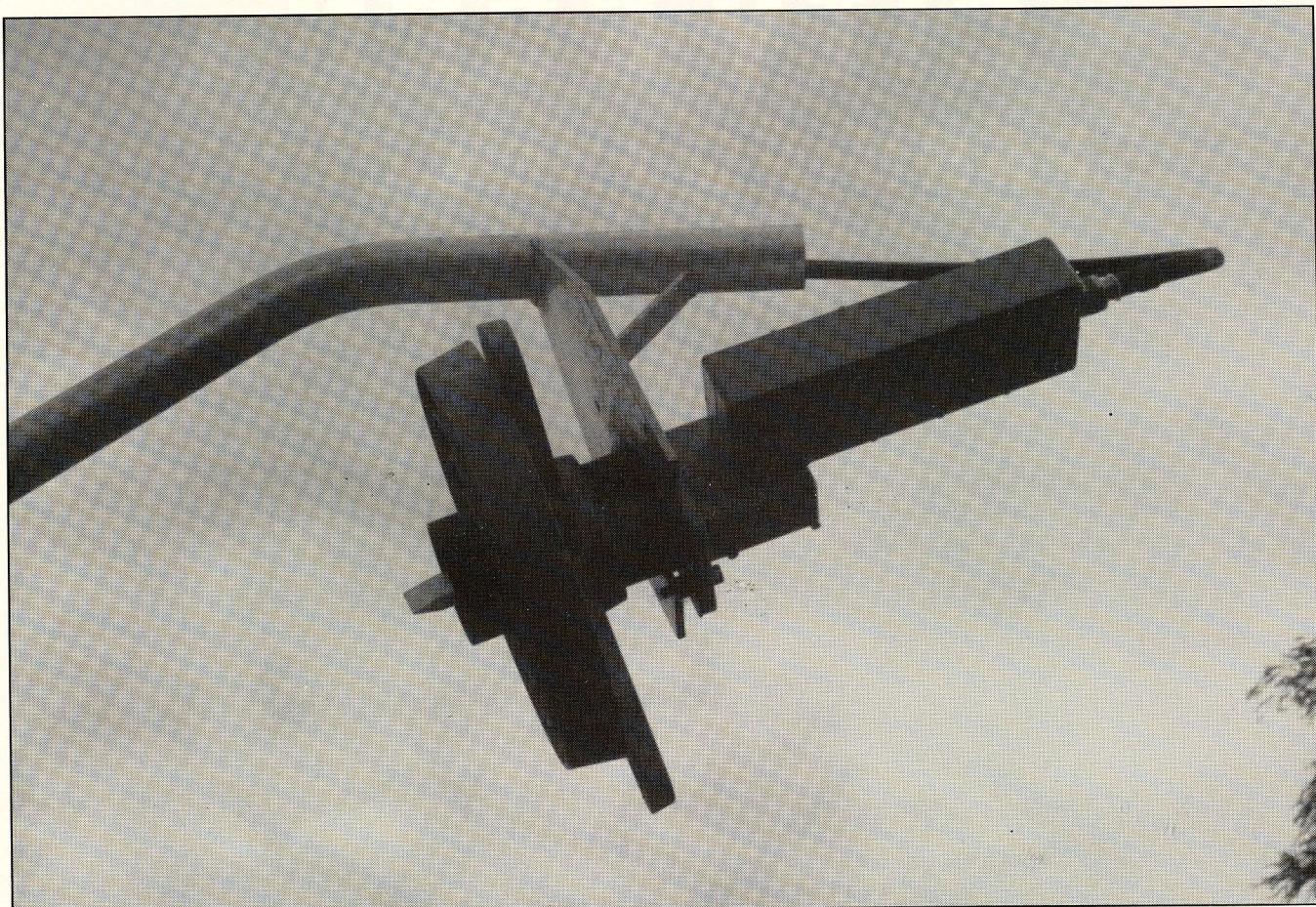


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C-BAND feed includes homemade scalar ring plus PTFE slab inserted in waveguide opening to turn right hand circular signals into linear horizontal signals.

however, as the English government decided to totally relax the prohibitions on privately owned TVROs, as reported in CSD for July 1, 1985. With the elimination of rules and laws against TVRO, we suddenly had a brand new business called Ku-band TVRO. Within weeks of the lifting of the ban, I was happily doing what any normal stateside TVRO dealer would be doing. Using 5.5 foot aluminum (or aluminium as they call it here) spun dishes of a UK manufacturer, DX front ends, and DX DSB-700 receivers, I was trailering complete systems from house to house and commercial establishment to commercial establishment for demonstration and sale. By the middle of July, I was selling three terminals most weeks, in my spare time, and their new owners were happily tuning in movies, sports, children's programming, a music channel, a TBS type service, and a host of other programs which tripled or quadrupled their basic television service from the four UK available terrestrial networks.

Now, some months later, this observation.

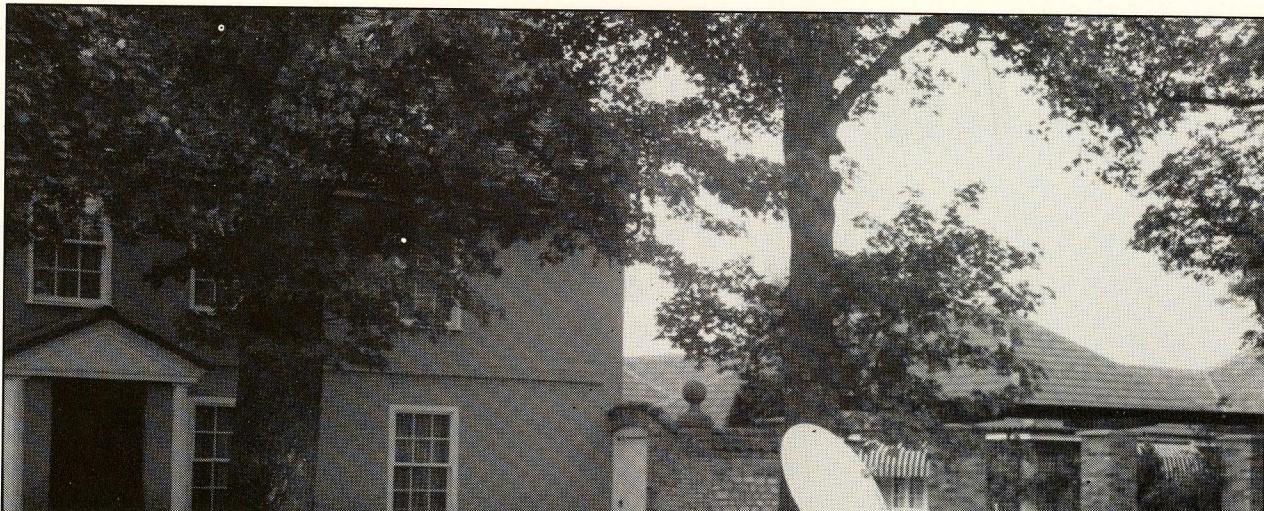
CNN/ENC, Ted Turner's new service widely available on 11 GHz, is best described as boring. Sorry, Ted, but I have hauled the six foot trailer-mounted demo dish from house to house (dozens and dozens, actually) and I shared Coop's optimism up front that having full-time, American style network news and special events coverage was going to be a big plus. I expected CNN/ENC to actually be a primary reason why I

would be selling many more of these small, under six foot systems in the UK.

I think the reason CNN looks so good to us is that it is surrounded by a wide selection of other (non-news) programming. When we have it as our one, sole, only program for major parts of the day (remember, the other European satellite channels only operate part of each day and 8-12 hour broadcast days are the norm here, for both satellite and terrestrial TV), well, it is boring.

"Where is HBO?" they asked me. "Where is the Playboy Channel?" they want to know. Yes, English people know about these other services, and they expect all of them to pour out of their screen through the magic of my six foot dishes and electronics.

Needless to report, perhaps, I have not sold nearly as many systems as I had hoped or planned. Even with approximately ten satellite-delivered channels including free (no, we are not scrambled yet) movies and sports and so on. Of those ten channels, four are located on a satellite at 2.5 west while the rest are on ECS. This means motor drives (now that is a problem for you!) and even on the fixed dish systems for 27.5 west, where CNN/ENC is operating, we have three services on one polarization and one (CNN) on the other. Yes, since Chaparral has not yet delivered any 11 GHz Polarotors, that means I have to go outside and twist and turn the LNB/feed by hand. At



SEB Italy on the screen; Washburn receiver bringing in daytime programming for AFRTS facilities in Italy. Schedule shows Family Feud, Mr. Wizard, Vegetable Soup, and cartoons coming up.

\$1,765 (US) a pop, we are definitely back in the dark ages of TVRO over here in Europe.

If CNN/ENC has been a disappointment (and I am a newsaholic so if I say it is boring, you had better believe how truly boring it really is!), the six channels on ECS are pitiful. Yes, people do watch but any one of them or even the sum of all combined could and would be blown away by MTV, Playboy, HBO, WGN, or WTBS. Once you have been exposed to American television and promotional efforts, it is very difficult not to be uncharitable towards other video products.

So, a few editorial comments. The expectation of satellite TV is already in Europe. The press has been filled with it and governments have talked about it in official and not so official terms. Most people have heard of it, and most people are expecting the American version of satellite TV to one day come pouring down a wire into their sitting room tellys. They will be disappointed with what they see, especially in those countries where satellite TV is going to be just more of what they already get on terrestrial TV. American TV, real American television, is panned by the snobs in Europe as in poor taste. I suspect, but cannot prove, that the first thing a European snob does on arriving on a trip to the United States is turn on his hotel room

TRAILER RIG/ not quite as high tech as in the states, this six foot dish is on demonstration at the Smokehouse Inn, Suffolk. Remember, this is Merry Old England!

telly and soak up our poor taste television. It is a little bit like the Playboy Channel in the states; nobody will admit to watching it, but if you observe where the dishes are pointing at 7:00 AM in the morning, an awful lot of people went to bed with them parked on F4.

Perhaps with my trailer rig I have had as great an opportunity to show off today's level of satellite TV as anyone in Europe. I have watched people's reactions and I have listened to their comments. They are already used to high technical quality television; the elaborate terrestrial relay network in the UK virtually guarantees everyone superb quality, 625 line PAL television. Satellite TV is less dramatically better to the average viewer here than satellite TV is to the average fringe area American viewer.

I am hardly discouraged by the results to date but I am also a practical man (even if I now have a 12 foot and a 6 foot dish in my garden!) and I see short term and possibly long term problems for the acceptance of satellite TV in Europe. People are expecting more than they are getting, and they are therefore reluctant to spend the money. I am not so sure, at this point in time, that satellite TV for Europe is going to be the huge market which so many people seem to expect.

Analyzing The Analyzers

The Final Chapter

We began our overview of the spectrum analyzer in the October issue of *CSD* (10-15-85) and have reviewed the general operating features for the Luly Satellite Spectrum Analyzer as well as for the Avcom PSA-35 Analyzer. Both units have been designed to service the home TVRO industry by providing hardware which will enable the TVRO installer or troubleshooter to check for the nature and extent of TI (terrestrial interference), evaluate system performance (dish, LNA, downconverter), troubleshoot for bad cable or connectors, and peak a dish and feed system for optimum signal level and minimized cross polarization. It seems the Luly unit at \$995 and the Avcom unit at \$1,965 are both after the same market.

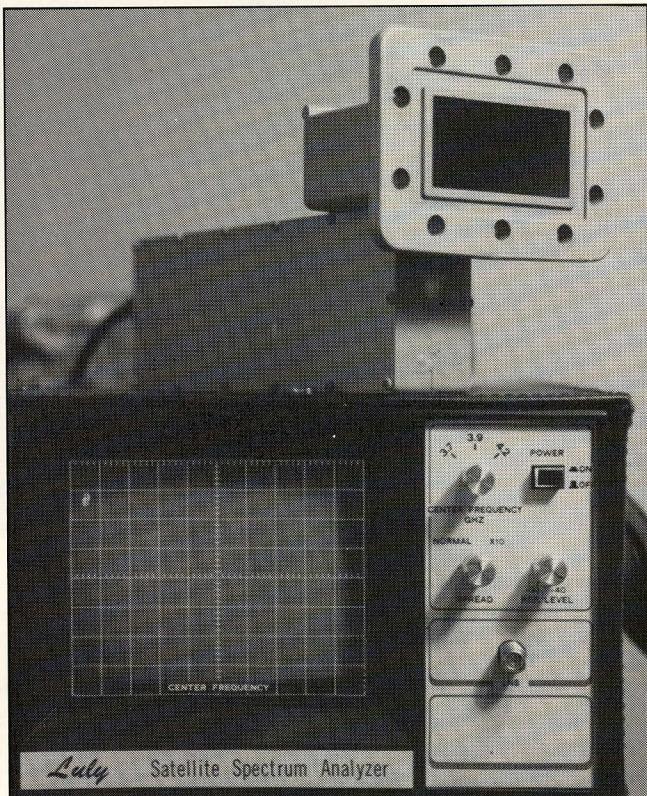
As we saw in December, the two pieces of equipment share a common technology but hardly identical or even similar operational characteristics. Let's focus now on the limitations of each and their usefulness to the TVRO installer.

Powering

Both units have self-contained batteries which require charging before use. The Luly unit batteries are hung on the top side in a small pouch which appears dangerously close to being ripped away from the main case every time you pick up the analyzer. Not to worry, in several months of use we never lost the batteries a single time. They just look like they are about to fall off.

You charge the Luly with an external (Luly supplied) simplistic charger. Unfortunately, the charger is not of adequate capacity to allow you to use it as a direct power source. That means that you will use the Luly only after it has been charged (up to 10 hours required in normal operation, as we found) and not while it is being charged (or connected to the AC charger unit).

The Avcom unit has its batteries inside and you are supplied with a power cord that connects to a standard 117 VAC (220 VAC on special order) power main. The cord operates the charging circuit which is built into the PSA-35, and it also allows you to operate directly from 117 VAC. The use cycle for the PSA-35 affects how long you can use it. Turning the instrument on and leaving it on will yield up to 90 minutes of continuous use if the Nicad batteries are fully charged. This compares favorably with the useful period of the Luly. Nicad batteries are unpredictable little beasts and they have a quality known as memory factor. A Nicad can sometimes forget what its real charged capacity is and it may only partially charge.

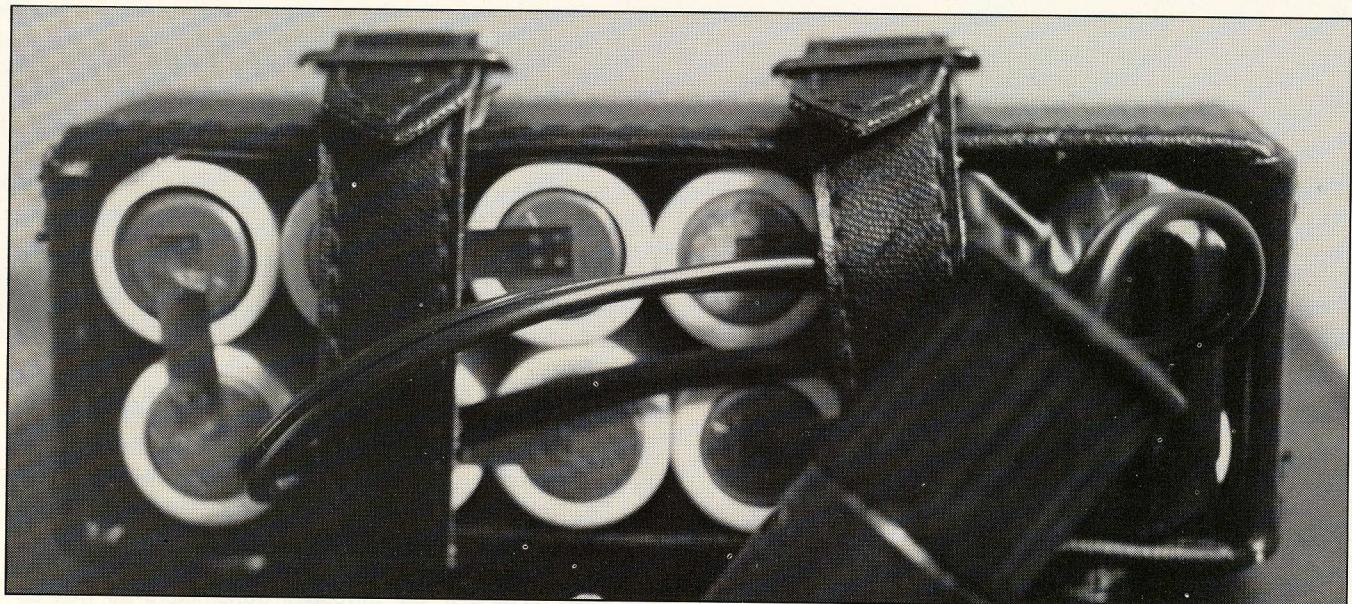


LULY ANALYZER covers 400 to 900 MHz band internally, but with LNB or LNA plus downconverter in front. It also covers the 3.7 to 4.2 GHz (downlink) band. The unit was created as a no-frills, straightforward field test instrument.

This means you may charge the unit for the recommended period of time (say 10 hours) and then find that you have but 30 minutes of useful life inside. When this happens, you need to drain the batteries to virtually no charge at all. This can be difficult given that circuits inside an analyzer automatically shut down the drain on the cells when the battery voltage dips to a specified low value.

The deep discharge is required to erase the false memory which the Nicad cells have acquired. In effect, you have to force them to forget the self-learned charging limits (by deep discharging) and give them a new memory by recharging them to the original capacity.

A user gets into the predicament by not using the batteries



NICAD PACK for Luly analyzer is an appendage attached to back of cover case, with exposed battery terminals to rear.

to their full discharged capacity early on (i.e., when the instrument is new or the batteries are new). One of the worst habits you can have is to use a Nicad powered instrument for a fraction of its battery-capable time and then slap it on an overnight charge. Pretty soon, the batteries think they need to be recharged at some artificially high (voltage) point and they simply refuse to take a full charge anymore.

The solution is to always run the analyzer unit until it has shut itself down from lack of operating voltage; don't constantly recharge from a semi-discharged state. And, if the unit is not to be used for a period of time, put it away charged rather than partially discharged.

Either the Luly or the Avcom unit(s) will have this identical problem; it is a function of Nicad rechargeable cells and not a circuit shortcoming of the analyzer. Develop good Nicad habits when you first start using a Nicad powered device and your battery supply will last far longer.

Still, there are complaints we have heard concerning the expected useful period with the Avcom unit in particular. Several people who are using its wide spectrum coverage (essentially 0 to 1500 MHz plus C-band) have found it very useful for wringing out a new SMATV system. As we have seen, you can test for operational distribution amplifiers, taps, drops, and other segments of an SMATV (or CATV) system with the units. The manual-suggested 90 minute operational period is perhaps too short for a full day of cable system wringing out. One solution would be for Avcom to build in greater battery capacity. This would add to the unit's weight and perhaps bulk, plus, of course, the cost. Another solution would be a clever outboard secondary battery pack which would allow the user to lengthen the useful life of the unit for extended field work. There is a need here and somebody is likely to come along to solve it. Right now you are battery limited and the maximum straight-time use you can expect is around 90 minutes.

One other powering related observation. The Texscan/Jerrold VSM series of CATV analyzer provides a front panel switch which allows the user to verify the state of battery

charge. The baseline display becomes a measurement tool and inscribed on the front panel faceplate of the CRT cover is a secondary "percent battery full" indicator. The idea is that the CRT can tell you whether the internal Nicad supply is 80, 50, or whatever percent full. We like that feature and feel that both Luly and Avcom would do well to supply a similar circuit in their analyzers. Knowing how much longer you can work, paced by the amount of battery life remaining, is a very handy bit of information.

Useful Information

Extended use of both the Luly and Avcom analyzers suggest to us that while the Avcom does have a superior low-threshold or sensitivity specification, there is little practical difference between the two in most applications.

There are other areas where the two units diverge in concept and therefore in operation.

1) Display selectivity—The Luly unit has a relatively broad IF selectivity curve and this means that when you have a set of signals relatively close together (within 10 MHz of one another), unless the two signals are nearly equal in amplitude, the weaker one of the two (or three, etc.) is lost along the sideband skirt of the stronger one. In most TVRO applications, carriers are spaced at 10 MHz or multiples of 10 MHz (such as 40 MHz channel center spacings). Thus you would seldom be faced with attempting to resolve closely spaced (in frequency) signals. But there is one common-to-TVRO application where you do need close resolution as we shall see. In this particular area, the Avcom PSA-35 is a distinctly better instrument.

2) Display stability—Both units are dependent upon conversion oscillator/mixers to place the desired band(s) into the input frequency range of the analyzer proper. The stability of the display, how much the individual carriers stay put on the screen in one spot irrespective of time or unit operating temperature, is of some concern. We found both were as stable as their

oscillators, quite irrespective of operating temperatures between 0 degrees F and 110 degrees F. We doubt anyone would be making serious frequency overtime measurements in temperature beyond these extremes. Thus, there is no clear better unit for stability.

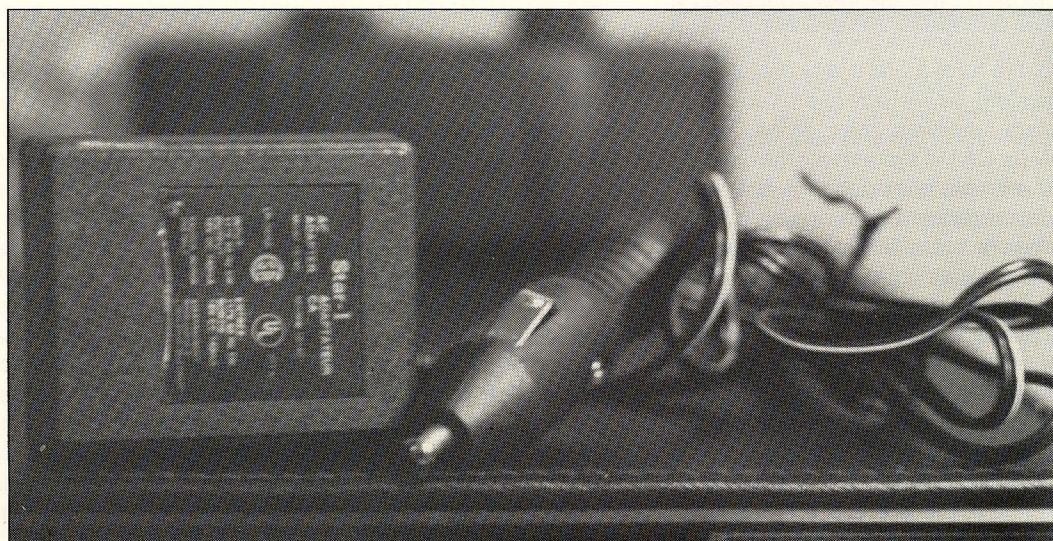
3) Display cleanliness—Ideally, when you disconnect any input signal (cable) from an analyzer there would be nothing displaying on the CRT but a relatively straight line with minor noise wiggles modulating the horizontal line. That's ideal. In a more practical world, the analyzer has its own internal oscillator(s) and mixers and they create signals and harmonics of signals which invariably leak into and onto the display. In effect, you end up with false signals showing on the display; signals which appear as if they were external (i.e., incoming from an antenna or cable) but, which in fact, originate within the unit proper. A truly excellent analyzer has no such false signals.

The design problems associated with totally eliminating false signals magnify as the frequency coverage of the analyzer increases. For each new band covered by the analyzer, there are new oscillator and mixer combinations and each of these must be reduced in amplitude (along with any harmonics or multiples of the oscillator signals) to levels equal to or lower than the maximum sensitivity of the analyzer. An analyzer that can read or display a -100 dBm signal, for example, cannot have any internal oscillator leakage greater than -100 dBm if you want the display to be clean of these internal, false signals.

Luly, being a single-banded instrument operating essentially from 400 (430) to 900 (950) MHz avoids any clearly visible spurious signals on the display. Avcom, being a six-banded instrument, is not so fortunate. On several different analyzers we counted various numbers of spurs clearly visible over the five primary (factory set) bands of interest. The greatest number of spurious signals we found popped up in the 0 to 500 MHz band (discounting the trash that appears below 10 MHz which is essentially the origination end of the display). The least number found is in the highest band: 3.7 to 4.2 GHz.

There is an unfortunate coincidence between the location and intensity of these internally generated spurious signals and one particularly useful potential function with the Avcom unit. That involves using the analyzer to readjust the operating frequency of (UHF) hand-held remote control units for satellite receivers or actuators. Here's how that works.

- 1) The UHF frequency band first employed for the remote control of satellite receivers (i.e., USS Maspro Sr-3 and others) or actuators (i.e., Houston Tracker and others) was just below 500 MHz. The hand-held unit is a miniature transmitter and stuck on the back of the TVRO receiver or actuator is a small whip antenna which receives the 500 MHz range signal.
- 2) Internal to the satellite receiver or actuator package is a small receiver which detects the 500 MHz signal received and interprets the commands to tell the receiver (or actuator) what to do. These small 500 MHz region receivers tend to be quite broad as receivers go, with only minimal selectivity.
- 3) Also in the same frequency range, around 500 MHz, we have UHF TV terrestrial transmitters as well as shared and non-shared spectrums used for various point-to-point and point-to-mobile two-way radio systems. In other words, in any given region of the country, you can turn on your TVRO receiver or your remote controlled antenna actuator and find some other transmitter source nearby in frequency.
- 4) These non-desired transmitter/signal sources will interfere with the proper operation of the radio controlled receiver or actuator. The solution is to move the operating frequency of the hand-held remote control unit, either up or down, to avoid the interference from the terrestrial signal source.
- 5) The analyzer is a very useful device to help with this since with it you can see the carrier from the hand-held unit as well as the interfering carriers in your area. Lacking a sophisticated communications receiver, you could never spot, identify, and work around all of the local interfering signals. Unless, of course, you had an analyzer.



LULY NICAD charger is small AC adapter not capable of powering analyzer as an AC power source.



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AVCOM PSA-35 has unfortunate spurious signals from internally generated oscillators which fall in useful sections of some bands.

Unfortunately, to make this work, you need two things in the analyzer:

- A) The analyzer has to be capable of resolving very weak signals (i.e., the hand-held unit) close in frequency proximity to very strong signals (i.e., a terrestrial UHF TV transmitter or a nearby two-way radio transmitter). The Avcom unit has this ability in all but exceptionally close-in-frequency applications; the Luly does not.
- B) There should be no unwanted spurious signal(s) in the same vicinity (in frequency) as the hand-held transmitter and the external undesired signals. The Luly passes this test but the Avcom does not. Unfortunately there are internal to PSA-35 spurs in the display which fall in the 500 MHz region.

The present generation of Houston Tracker radio remotes utilizes a hand-held remote frequency in the region of 385 MHz. The present generation of USS Maspro receivers utilize a UHF frequency near 340 MHz. Earlier versions of both used UHF radio channels in the 500 MHz region.

There are a couple of medium lightweight spurious signals with the PSA-35 analyzer in the 500 MHz region; We measured levels between -85 and -90 dBm. These spurious signals are not themselves strong enough to be confusing to the user trying to move the factory set hand-held transmitter to a clear spectrum region. But the source of these spurs, inside the PSA-35, can cause direct problems with the receiver in the Houston Tracker or USS Maspro receiver proper. These are resolvable problems. Avcom is aware of the nature of the problem and has a probable fix for most applications. We talked with Andy Hatfield about the spurs (spurs that are in the -85 to -90 dBm region are not severe from an engineering point of view) and he felt that an additional isolator, built into the PSA-35, might insure that the LO/conversion signal could be dropped an additional 20 dB for special applications like this.

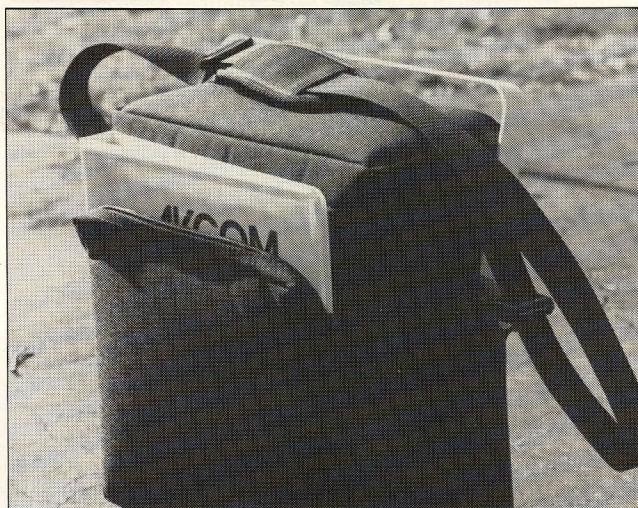
This consumer caution about using the PSA-35. The span width (or sweep width) on virtually any band can be adjusted to exceed 500 MHz (the nominal width of a single band). If you crank the span control too far clockwise and then adjust the slide control to select the operating frequency center all the way to the right, you will see what appear to be spurs on several of the five (six) operating bands with the analyzer. These

are out of band signals which are not part of the real display. You simply have the controls mis-adjusted and should not be misled by the perceived appearance of spurs given these control settings.

Casing

We have already commented that the Luly external Nicad battery pack appears at first blush to be ready to fall off the leather-like case. As a practical matter, the batteries do present a problem because they tend to get hit first, protruding as they do from the top of the case. The shame here is that the batteries could not have been stowed inside; Luly did not provide for an internal battery charger or the capacity to run the analyzer on 110 VAC during an alternate charge or AC-operate switch selected function. In addition to this, a snap-on cover for the faceplate of the analyzer lasted only a few hours in regular use. The snaps simply broke apart with mild repeated use. The solution to this could be a better selection of snaps or, far better, the replacement of snaps with Velcro strips as we ultimately did with our unit.

The original Avcom PSA-35 unit had no case and no faceplate cover. A plastic, molded faceplate cover is now available as standard equipment and this protects the CRT face, as well as the knobs, from getting dinged, scratched, or broken. More recently, Avcom has announced a very high quality carrying case for the PSA-35 which totally protects the instruments from abuse in the field. A pocket on the front allows the user to carry the needed connectors, adapters, and cables all in one

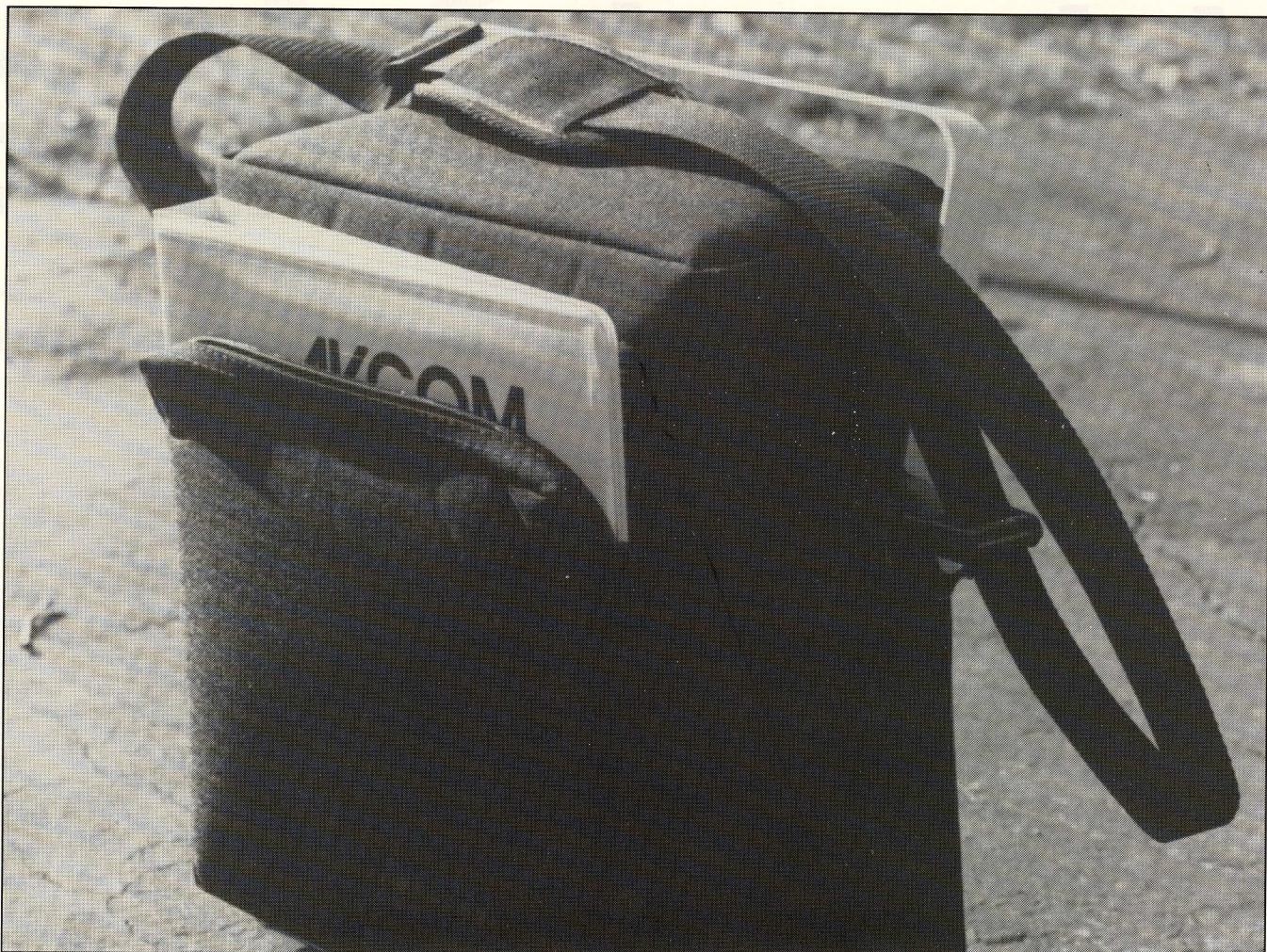


PSA-35 is now available in complete wraparound heavy-duty case which totally protects the analyzer from mishandling and physical damage. Unit shown here with front cover unzipped for instrument use.

place. The front pocket is not large enough to hold the comprehensive user's manual. A shorter quick reference manual is being prepared as a refresher for the casual user, since the larger manual should probably stay in the shop anyhow.

Accessories

Luly stands by the basic unit which they suggest is designed for nonprofessional use by an installer who faces real world problems but who does not pretend to have an engineering degree. At the \$995 suggested price to TVRO dealers, the



CARRYING CASE for PSA-35 is heavy, rugged, and good looking. Pocket on front, misused here for master manual, is for cables and connectors used by engineer.

Luly Analyzer fills a void in TVRO test gear and is a decent buy.

Avcom has taken a higher road with their PSA-35 and feels that a serious installer of TVRO will want to amortize his analyzer investment over a wide range of uses, including SMATV and cable system check out. The multiple frequency ranges covered by the PSA-35 accommodate this extended use while the single frequency range of the Luly pretty well pins down its uses to the straight forward TVRO applications. And even at that, by not including frequency coverage of the 70 MHz band, Luly has made this package essentially a TI checking RF package or a 400-900 MHz IF range package.

Avcom has been introducing an extensive series of accessories for the analyzer. They now include:

- 1) TISH-40 feedhorn, to allow the user to probe for TI signals when coupled to an LNB/LNC or LNA plus downconverter.
- 2) WCA-4 waveguide to coax adapter which allows the user to inject into and out of standard waveguide to test component units such as LNAs for operation.
- 3) MSG-4 microwave signal generator, a 3.5 to 4.3 GHz signal source with an internal modulating tone which produces a bar pattern on the screen and with

which an installer can quickly determine if his 4 GHz range LNA/LNB/LNC or downconverters are operational, as well as check out feeds and antennas.

The MSG-4 is particularly interesting because it is self powered with another of the Nicad battery packs. Therefore you can take it into the field to provide a relatively stable and known level signal source in the 4 GHz region. We'll look at its operation in a subsequent issue of CSD.

4) Frequency calibration tool which allows the user to conduct more precise frequency calibration of a 70 MHz system and to inject or test units with a 70 MHz IF (as well as others).

Summary

Test equipment in TVRO has come quite a distance in the past year and the application of modestly priced spectrum analyzers is an entirely new area of expertise that the serious dealer must spend time learning about. One year ago we decried the lack of designed-for-TVRO test equipment in CSD. Now we have an abundance of choice and the dealer is potentially far better off because of this new professionalism in TVRO test equipment.

Hurricane

Unexpected Opportunity

Way back in the summer of 1979 when Bob Cooper selected beachfront lots on the north shore of the Providenciales, Turks, and Caicos Islands as a site for a future home and research labs, he asked the real estate salesperson about hurricane tides. "How far back from the beach should we build the house to protect ourselves from hurricanes?" was the question. The real estate type smiled and pointed his finger directly out over the beach to the northwest. "About 2,400 miles in that direction!" was the response.

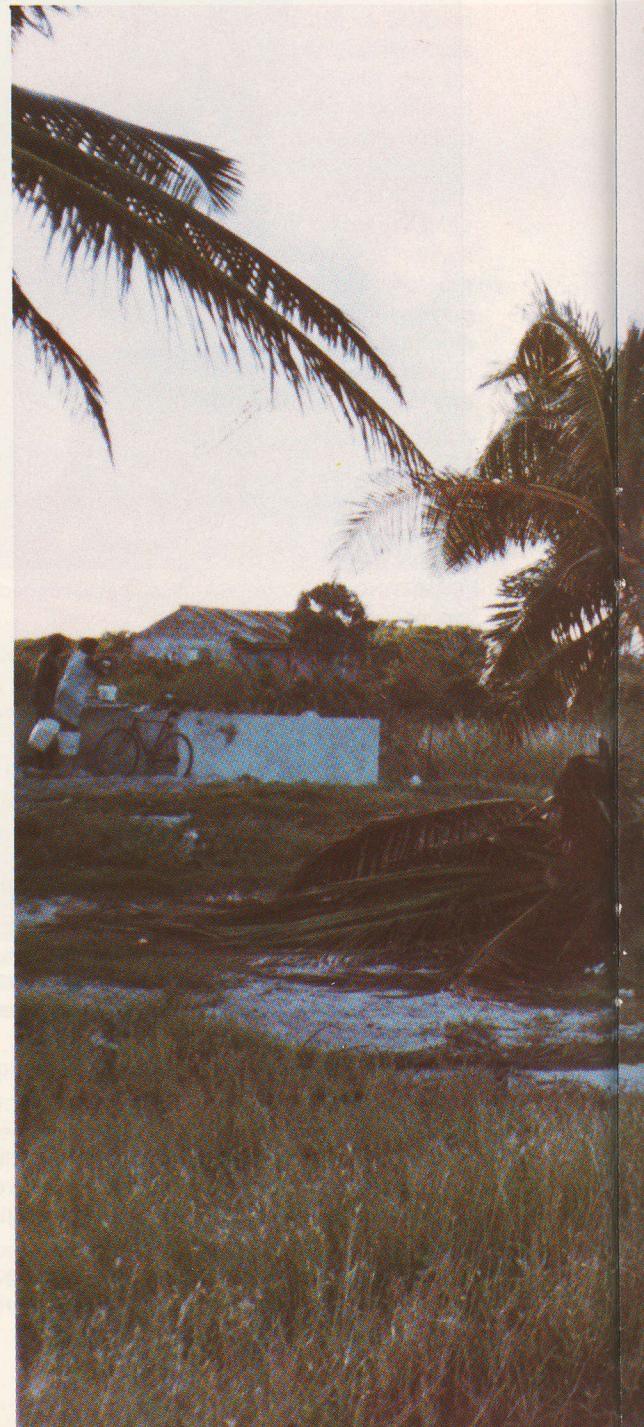
Hey, not to worry. The last devastating hurricane was back in 1950 and prior to that it had been 1945. Coop liked to show people what the 1945 hurricane did. An earlier hurricane, in 1937, had washed thousands of ripened coconuts ashore and natives who survived the storm had planted those coconuts as seeds. Hundreds of coconut palms have sprouted from those

An earlier hurricane, in 1937, had washed thousands of ripened coconuts ashore and natives that survived the storm had planted those coconuts as seeds. Hundreds of coconut palms have sprouted from those planted shells and when the 1945 storm hit, the new trees were 8 to 10 feet tall. The storm had laid the trees over on their sides, growing no longer straight up towards the sky but now growing virtually parallel to the sandy soil.

planted shells and when the 1945 storm hit, the new trees were 8 to 10 feet tall. The storm had laid the trees over on their sides, growing no longer straight up towards the sky but now growing (if you can call it growing) virtually parallel to the sandy soil.

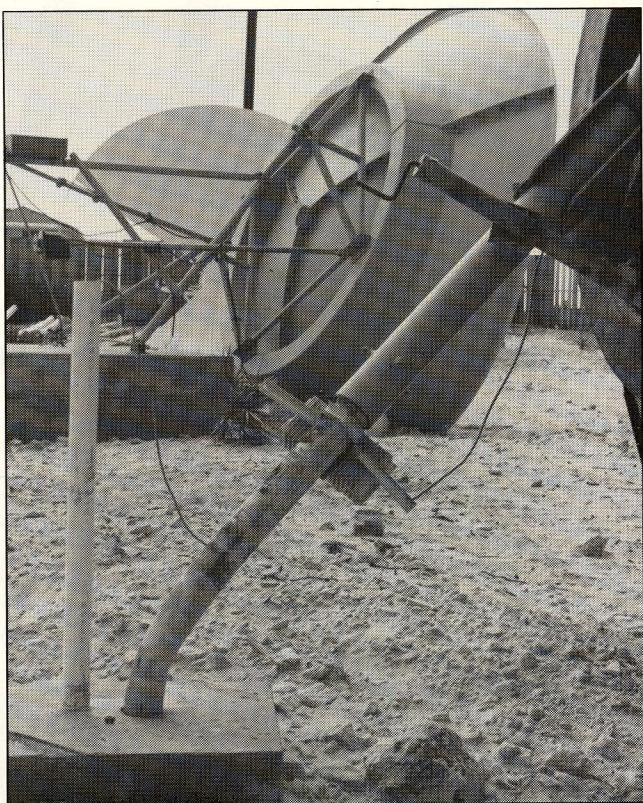
Palm trees are resilient survivors. In the years that followed the storm of 1945, they had continued to grow. But not horizontally; the trees simply turned upwards at the end and continued to grow. There are hundreds of palms on Provo that grow parallel to the ground for 8 to 10 feet, and then suddenly turn upward to continue growing towards the sky. Satellite antennas probably do not possess that ability.

Hurricane Kate was an odd storm as hurricanes go. It crept onto the Weather Channel map on Saturday in mid-



Kate





12 FOOT 1.6 GHz Weather Satellite dish (foreground) bent pipe mount over in spite of being filled with concrete. So much for making pipes stronger with fill material.



USS 16 FOOT fiberglass failed because of improper anchors, not dish or mount failure. No more Red Head lag anchors.

November, attracting little attention. "No hurricane this late in the year has ever made it up the east coast," they said. For most of Saturday, November 16th, it was ignored. The storm was located almost directly north of San Juan, Puerto Rico, and it was following a generally westerly track. Nobody seemed concerned, and winds were reported to be around 85 MPH.

The NOAA weather satellite photos, downlinked to the WIV facility directly at 1.6 GHz, showed the storm to be considerably larger, however, than the Weather Channel was reporting. By late Saturday, winds on Provo were averaging over 20 miles per hour and the WIV (TV) weather instruments were recording gusts to more than 35 MPH.

Sunday morning dawned dark and overcast. A check of the WIV weather instruments showed average wind speeds now 35 (MPH) with gusts in the mid-40s. The sea was chewing large chunks of sand dune away from the beach and small limbs were littering the grounds. A tri-band amateur radio beam antenna was wrapping itself around a support tower. Standard hurricane procedure should have called for putting plywood storm shutter covers over every window and door in sight by now. We hesitated several critical hours which was too long.

An Atlantic-Gulf flight was scheduled away from Provo to Miami at 2:30PM that afternoon. Coop had a seat on it and scheduled to come down from Florida on the same airplane would be industry engineer John Ramsey of Sat-Tec/Ramsey Electronics. Against all odds, the BAC-111 plane did make the trip and as Coop boarded and Ramsey deplaned, the sustained winds were 51 MPH on the beach. Stuck behind a row of hills, the wind at the airport was surprisingly calm.

"What's new?" queried John Ramsey, as WIV's Marshall Foiles loaded Ramsey's baggage into the Blazer for the ride to the WIV facility. Foiles smiled and gave no response. Minutes later, as the Blazer pulled away from the airport and left the shielding of the hills, the winds struck the vehicle.

"Wow, some windstorm!" Ramsey said.

"No, some hurricane!" responded Shari Foiles. Ramsey, it turned out, had flown into a hurricane without being aware of the storm's existence. He would have several reasons to reflect on his lack of knowledge in the next 48 hours.

"The last recorded wind speed I saw was 77 miles per hour," remembers Ramsey. "Then the power went off." The Provo power system is designed so that when the winds reach a certain speed, the generator for the island simply shuts down. High winds whip power lines about without mercy, and sooner or later the winds will rip lines loose and leave them dangling across roadways. To prevent accidents that can maim or kill, the power service simply shuts it all down.

They ate by candlelight that Sunday evening while the cooks at the Island Princess hotel fixed cheeseburgers over a gas grill. Ramsey had not eaten in the new second floor Island Princess dining room; it had been completed and open less than a week when Kate came by. By 4:00 AM Monday morning no one would ever eat in that dining room again; the entire top floor of the Island Princess Hotel would be a scattered memory with pieces strewn over several miles of Island.

"There was no way we could sleep," recalls Marshall Foiles. "We had lost all electricity and I considered cranking up

the 7.5 kW standby generator. That seemed like a foolish thing to do just to be able to get power to some weather instruments so we would know exactly how hard the wind was blowing. We already had a pretty good idea; coming back from the Island Princess, we found the front gates and fence to the WIV property blown to smithereens; two metal TVRO dishes, built into the fence as decorative pieces, were laying on the ground rattling around in the winds. Tree limbs were blocking the driveway, and it was quite difficult to walk."

Several times, before the 3:00 AM approach of the hurricane's eye, Foiles and Ramsey would lash themselves together with heavy rope and crawl to the 20 foot antenna field and then to the beach. At the antennas, they attempted to resnug huge bolts that were supposed to keep the antennas standing upright. At the beach, they were concerned that a storm tide might rise up and smash over the top of the two protective sand dunes separating the buildings from the ocean.

"If we saw the storm tide coming, we were prepared to jump into the Blazer and head for higher ground! We had emergency food, water, and a complete ham radio station packed in the Blazer for a quick get-away."

A storm tide is the most dangerous part of a hurricane. Normal tide variations on Provo are only a few feet. A storm tide might increase the ocean's water level by 9 to 12 feet. That much additional water would sweep the ocean over both of the protective sand dunes and directly into the twin buildings. Not much would be standing if that happened. People caught in it would die.

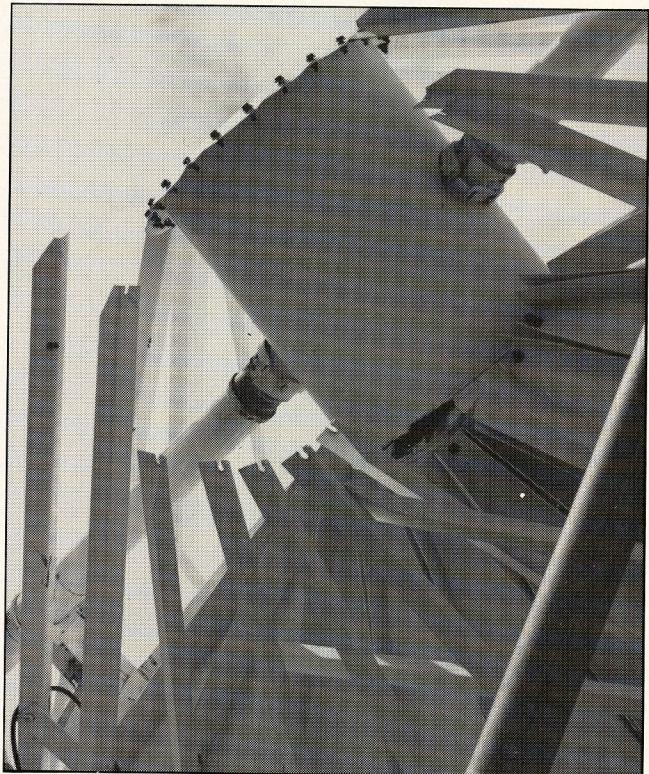
"On the VHF radio, we heard the people at Club Med say 'The eye is here,' and that bothered us because here we were only $\frac{3}{4}$ of a mile away and the winds were still blowing full force. It took 10 minutes for the relative calm of the hurricane's eye to travel that $\frac{3}{4}$ mile. Then suddenly, the winds virtually quit and there was an eerie silence. John and I went out to assess the damage," recalls Foiles.

What they found was manageable. Winds of 105 to 110 miles per hour had raked the satellite antenna lot for 2 hours and winds only slightly weaker had been pounding the antennas and buildings for another 12 hours. "At that point, we might have lost a pair of ADM 20 footers, and a handful of smaller dishes. I was very pleased with the damage assessment."

All of that would change in the next few hours. When the eye finally moved through (it took more than an hour), it was as if a giant knife switch in the sky had been thrown and suddenly the 105-110 mile per hour winds returned. Now, rather than blowing from the northeast, the winds were originating in the southwest. All of the antennas and mounts, beaten by strong winds from one direction for half a day, were suddenly subjected to equally strong winds from exactly the opposite direction.

"I know the book says the backside winds should be the same as the front side winds," commented Ramsey, "but man oh man, they sure seemed much worse!" It was approaching 5:00 AM, and there was not much to do but collapse in a fit of exhaustion as the rear side of Kate slashed away at anything left standing by the leading edge of the storm.

The first light of dawn revealed the true extent of damage. A total of 25 satellite antennas, from 8 feet to 20 feet in diameter, had been in operating condition before Kate. As the wind

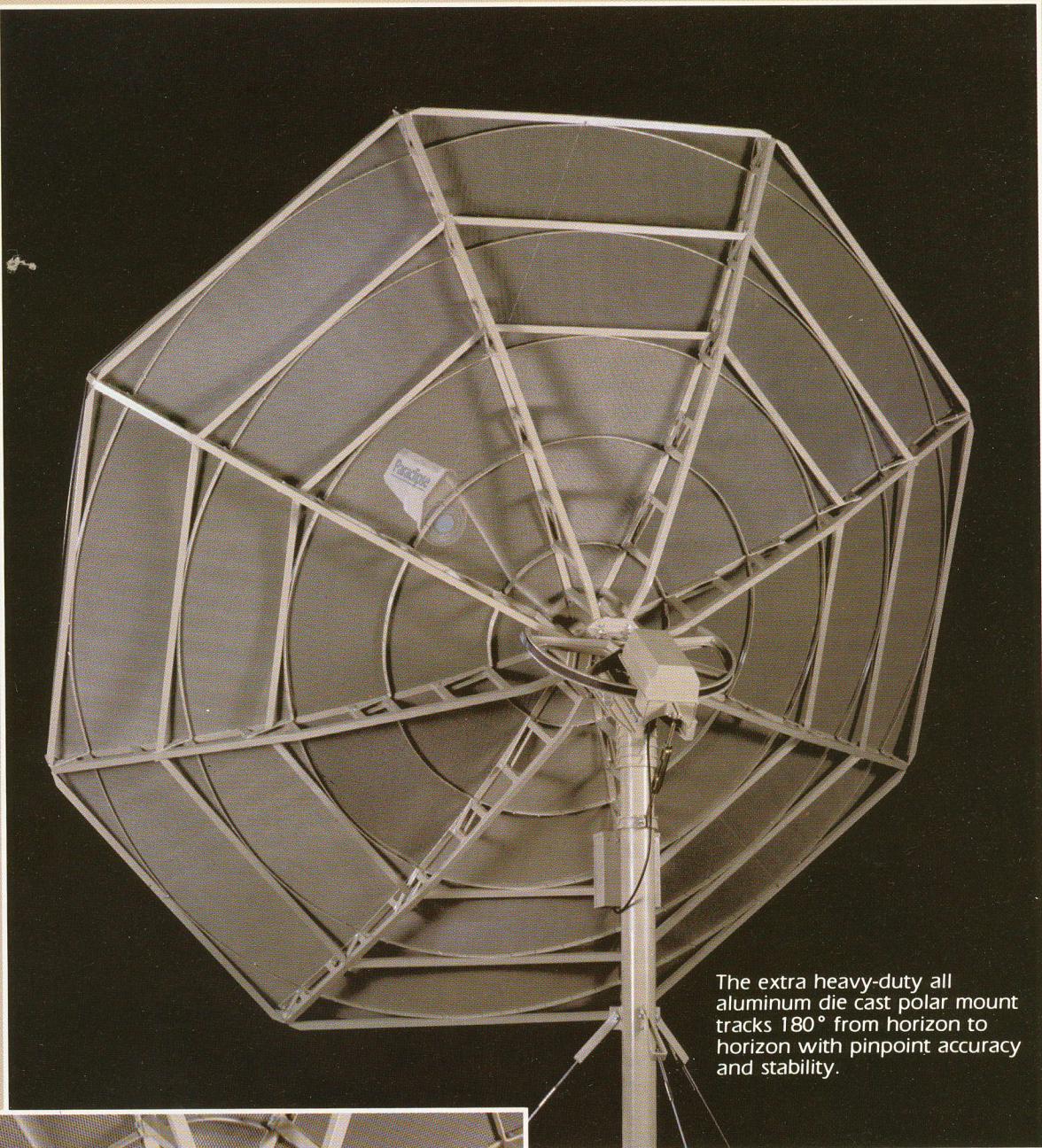


REAR BRACES on ADM 20 footer were yanked out of the rear-of-hub attachment point leaving the top half of the dish unsupported. The dish folded over on itself in center.

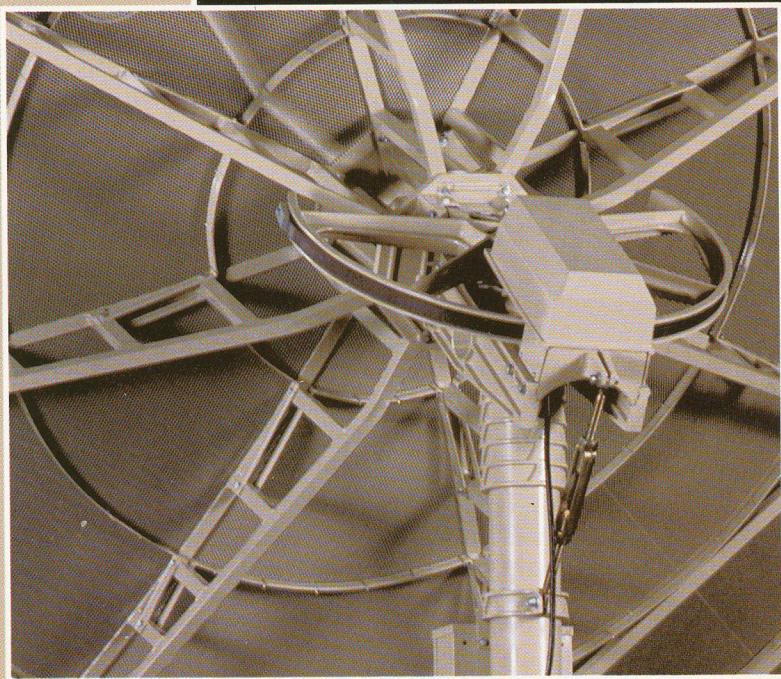


ADM 20 FOOTER, one of four that collapsed, came apart because rear braces came loose and the dish folded up in the center like a giant clam shell.

ParclipseTM CD



The extra heavy-duty all aluminum die cast polar mount tracks 180° from horizon to horizon with pinpoint accuracy and stability.



RIGIDITY For an antenna to produce a sharp, clean picture it has to maintain a very high degree of parabolic symmetry. The structural integrity of any antenna design will greatly influence its gain and beamwidth characteristics. Strength is critical for good performance.

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ENDURANCE You'll want an antenna system that performs without excuses. You'll want that same performance tomorrow as well as years from tomorrow. Start with a high performance Parclipse system and that's what you'll get.



Our guyed feed system is perfectly tuned to fully illuminate the reflector and to optimize the satellite signals. It is the strongest and most accurate system available.

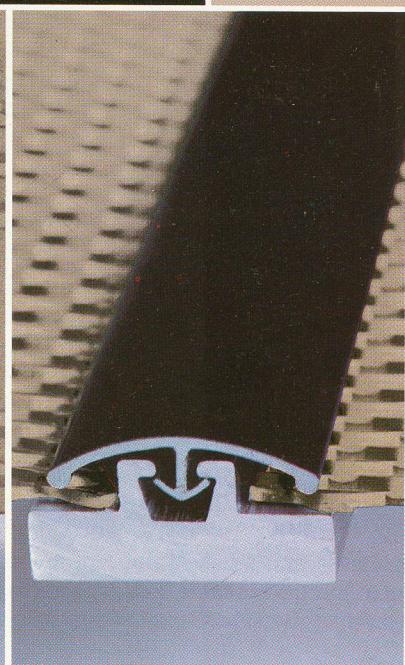
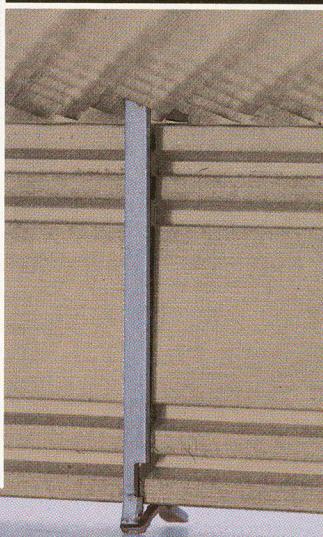
Paracipse CD

PIONEER MEMBER OF
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FAR RIGHT
Die cut mesh panels fit easily into place between the new leading edge rib extrusions.

RIGHT
The mesh panels are held firmly against the rings by snap-in clips. The result is a very clean looking mesh installation



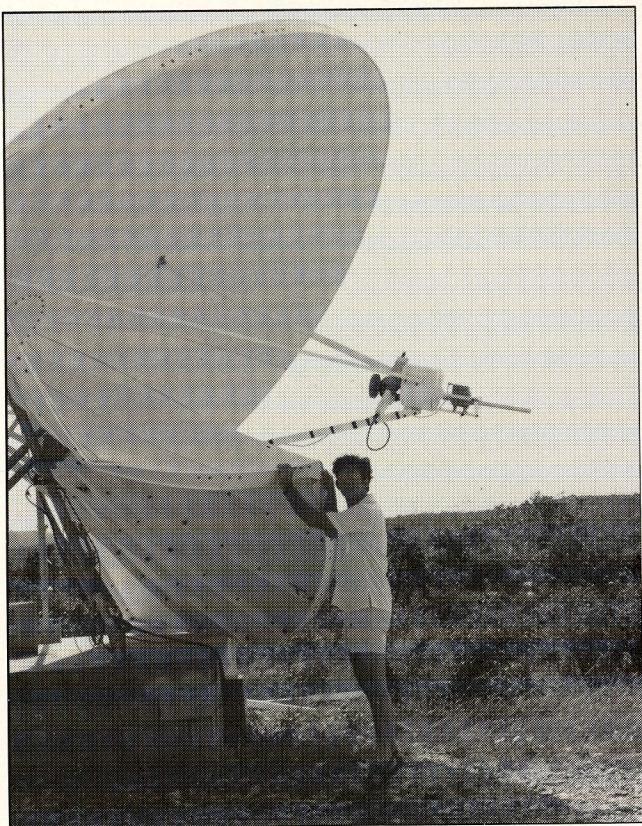
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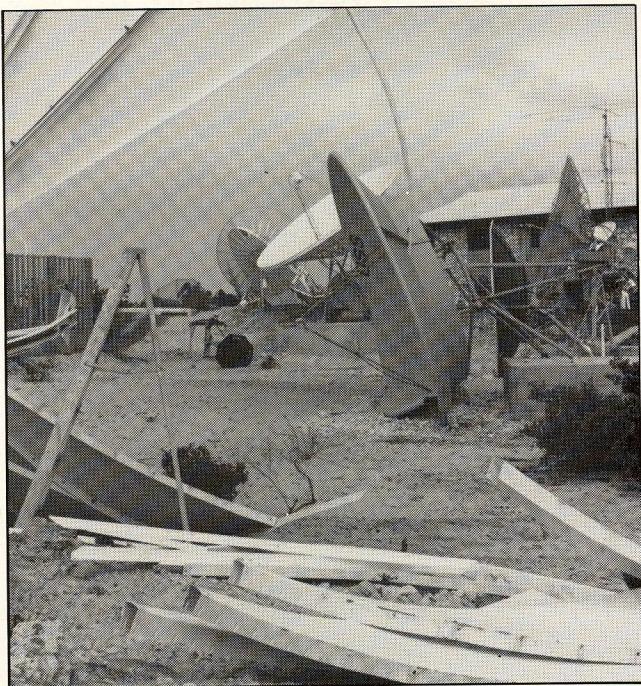
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A TOTALED/ADM 20 footer at WIV tower first rammed into concrete pad when actuator gave out. Bottom folded up from beating on pad, followed by rear struts busting loose on top panels resulting in dish 'clam shelling' at end. Coop inspects.



WHEN THE DISHES folded in half, the lower panel sections ground into the concrete pads, destroying parabolic shape of panel pieces. Denuded Hero 13 footer is in the background.

speed dipped into the 40s and they could move about again, only 2 of the 25 were found to be operational. Cranking up the standby power plant, the systematic checkout of the damage began.

"One of the first things we checked was the Weather Channel," reports Marshall Foiles. "They were muttering something about the storm lashing the coast of Cuba and gave only passing mention of it having been through the Turks Islands. They couldn't even pronounce our island names correctly, and they had us out of the storm at a time when the wind gusts were still hitting 50 MPH." Well, so much for The Weather Channel.

Damage throughout Provo was far milder than expected. Several houses simply disappeared with the type of debris trail one expects to find after a tornado. Dozens of roofs lifted off into orbit, and power poles were scattered like tooth picks over roadways. Miraculously, nobody had been hurt. It would be weeks before full electrical and telephone service was restored, but the satellite antennas did not fare so well.

Damage Assessment

The most graphic damage sustained was to solid surface dishes. Before Kate, five of the ADM 20 foot antennas had been in service. After Kate, only one was capable of being placed back into service; the other four either clam-shelled by folding over in the middle when their rear strut supports pulled loose from the hub, or they simply blew apart as dozens of pieces flew off the monster antenna leaving them too weak to stand upright. We'll come back to the reason for the losses shortly.

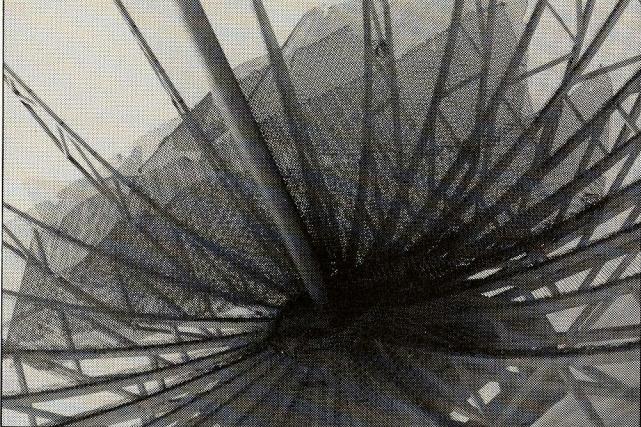
Screen-mesh antennas, as a family, survived far better than other antennas (i.e., solid metal or fiberglass). This is contrary to some reports from hurricanes striking the Gulf Coast this past fall. We'll see why this might be so shortly.

Mounts proved to be the weak spot for virtually all antennas; those few that had suitable mounts suffered either no damage or very limited damage.

Those who have been in the industry for a few years will recall a series of hurricane tests conducted by Paradigm Manufacturing Company in the summer of 1983. Using gigantic wind machines, Paradigm tried to blow some of the 12 foot antennas apart. To make the tests more real, the 75 miles plus (hurricane force) winds were married to thousands of gallons of water dropped into the machines. The antennas, some of Paradigm manufacture and some competitive, were subjected to the combination wind and water and then the damage was assessed.

A vivid advertising campaign captured the tests and illustrated how their screen-mesh antennas had been proven to survive hurricane winds. This series of tests immediately prompted other copy tests by similar manufacturers, and started a debate among antenna engineers as to the true wind resistance of mesh. CSD and CSD/2 carried extensive reports and opinions on these tests during 1984 and 1985.

The bottom line, according to Paradigm, is that properly designed mesh antennas withstand heavy winds (and water) better than solid antennas. The theory seems to be that while the mesh surface does present an impediment to the flow-through of wind, the resistance is far lower per square inch, or foot, than a solid surface would be. Wind forces that build up a dish surface turn the dish into a small sail. Imagine trying to



SHREDDED MESH/ Hero 13 footer peeled mesh from dish circumference and then stacked it up in layers towards the hub center. Dish itself survived.



TIPPED OVER/ 20 foot ADM dish collapsed onto its lower lip when front leg of tripod mount gave way. Panels from another dish helped this one back into service.



HOUSE IS GONE/ scattered pieces of lumber and a foundation are all that remains as Avcom's Pat Hatfield inspects damage on Provo after Kate ripped through.

support and carry a 4 by 8 sheet of plywood in a mild wind. Now, imagine trying to carry the same piece of plywood with a 75 mile per hour wind blowing. Yes, the surface areas of the solid plywood is going to catch a great deal of wind. If you poked holes in the plywood, some of the wind would pass through and the wind load would decrease. But, by how much?

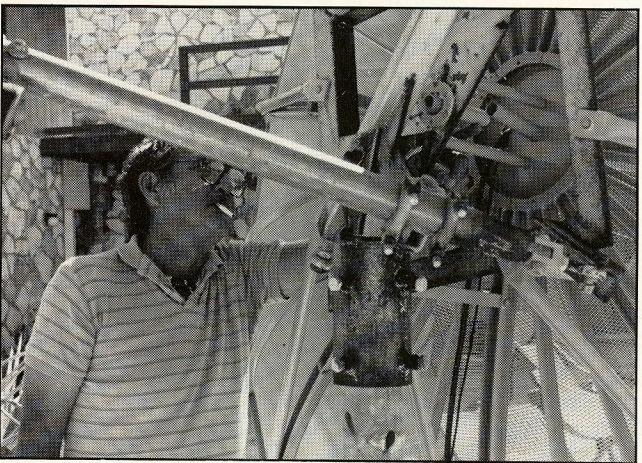
Another popular theory is that when wind strikes the screen mesh, small eddy currents are set up which deflect away from



LAG ANCHORS pulled out/USS 16 footer turned over and ground into coral when these Red Head lags were yanked out of concrete pad by 110 MPH winds.

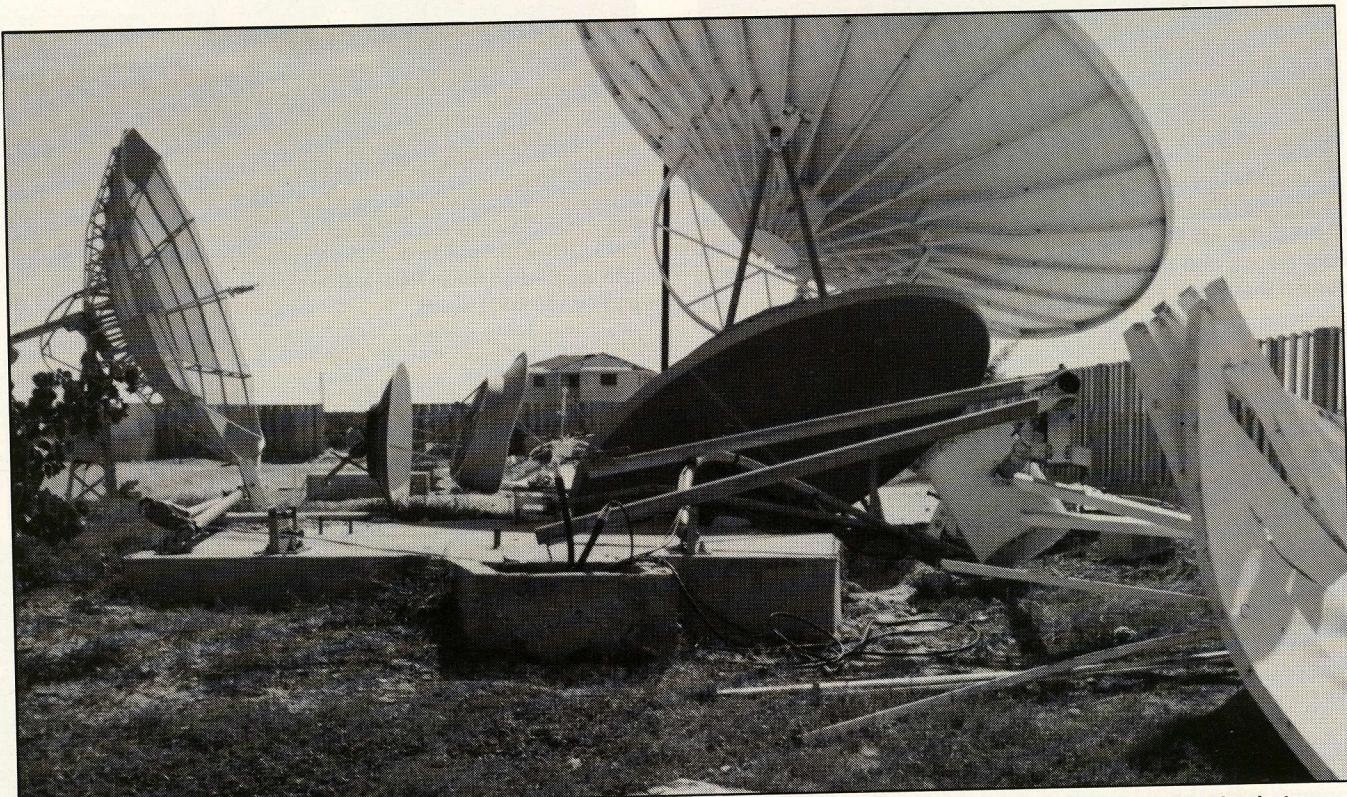


PIECES ONLY/ ADM 20 footer (center) is in pieces after Kate; 10 foot fiberglass dish lays impaled on ground post on right. The building survived intact, more or less.



FLIPPED ECI 11 FOOTER/ Cal Piper of Island Princess Hotel inspects upside down ECI antenna that wrenched its post mount into awkward upside down position during Kate. Antenna surface survived.

the wire mesh strands. These eddy currents, the theory goes, form a wind sheet over the surface of the dish and this, in effect, fills up the holes in the mesh. If you subscribe to this theory, you believe that at some speed the wind no longer can flow through the mesh surface and from that point onward the mesh surfaced dish acts like a solid surface dish. Furthermore, because mesh dishes are known to be lightweight and not overly strong, this theory suggests that as the mesh becomes solid the relatively lightweight dish and its support structure simply fold up under the pressure. We would see.



TANGLED DISH FARM/ Paraclide 16 footer (left, rear) and ADM 20 footer (right of center) survived. The five other dishes in photo were destroyed (see text).

Two That Survived

As noted, out of 25 operating antennas, two survived and they were still operational after Kate. One was a 16 foot Paraclide (Paradigm) horizon-to-horizon dish and the other was the new Paraclide 9 foot CD series horizon-to-horizon. Both of these antennas were ready to produce satellite pictures when power returned; none of the other antennas could make that claim.

At the opposite end of the scale, four ADM 20 foot dishes were destroyed, although we would eventually be able to piece together two operating antennas. A fifth ADM antenna survived with minor damage. It was an interesting sub-study because it was a one-of-a-kind horizon-to-horizon mount dish driven not with a traditional electrical drive but rather with a hydraulic drive system using fluid-pressure rather than electrical force to move the dish.

There were two recurring themes to the damage assessment:

1) Linear actuators (i.e., standard jackscrew type motorized arms) did not survive. Under the strong wind pressures, the antenna sail created such forces on the linear actuators that they were driven closed (i.e., they screwed in as the winds pushed the dishes from the rear). Once closed, the wind pressures simply kept working on the actuators until either:

- A) The actuator broke loose of the attachment to the dish by snapping the ear connecting the actuator to a dish strut, or
- B) The actuator itself failed (several had their internal

gears stripped by the wind forces working against a fully closed actuator).

2) Mounts, either the pipe mounts supporting the dishes and/or the antenna OEM supplied bracket assembly attaching the antenna proper to the pipe, were tremendously overrated for their ability to keep the antenna upright under the strong winds. Mounts:

- A) Bent at the top, where the mount to pipe attachment takes place.
- B) Spun free when the bolts holding the antenna to the pipe broke loose(*).

(*It has been our practice to pin all mounts to all pipes with bolts inserted through the pipe support. In these cases, the mounts did not spin free but rather bent and warped under the winds.

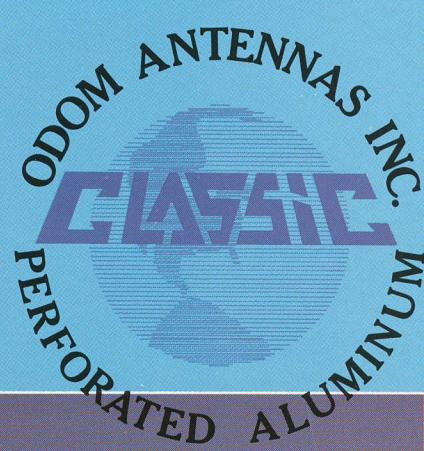
After the fact, it is difficult to be certain whether actuators or mounts broke first. Antenna after antenna (22 in all) showed us that once the actuator breaks free, and/or the mount begins to come apart, the antenna becomes a freewheeling sail whipping back and forth in the hurricane winds. Once the antenna begins to freewheel, it slams into the ground, posts, or anything nearby, and this slamming action quickly bends or breaks pieces off the antenna. More than a dozen antennas in the WIV test facility suffered this type of damage. Our summary of the mesh-type antennas, which suffered less-than-total destruction, is as follows:

- 1) Mount Failure: We believe 8 of 13 antennas suffered surface and rib damage because some portion of the

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THRU. . .

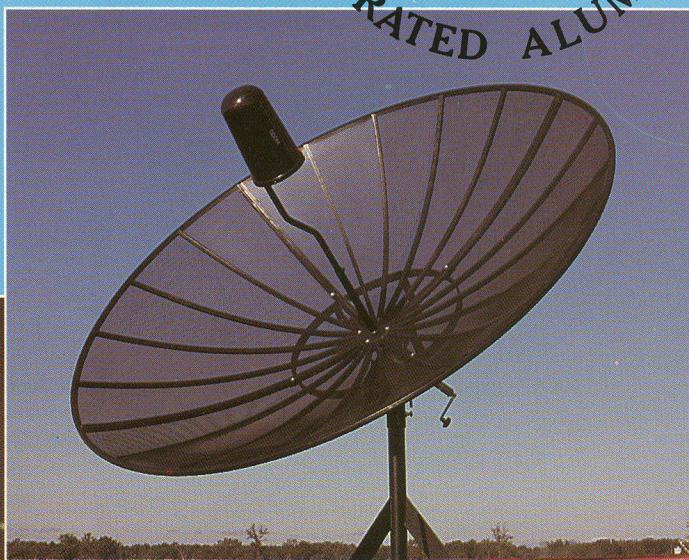
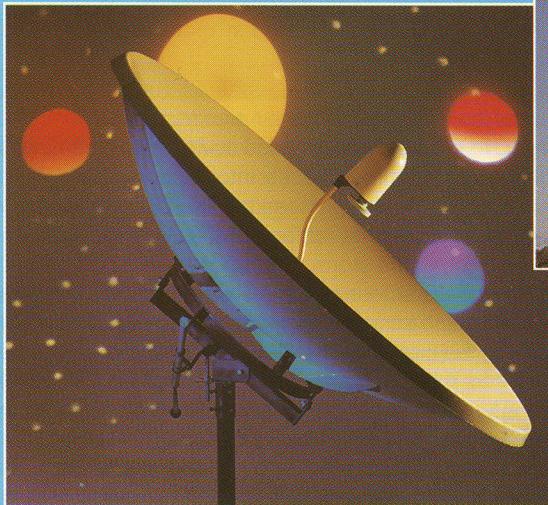
NOT THE SIGNAL!

IT'S AN ODOM, IT'S A



Our NEW Perforated-Aluminum Dish is designed to meet your customers needs now and for years to come. Our 10' Classic is ahead of it's time and you can see the difference in the construction and the performance of an ODOM.

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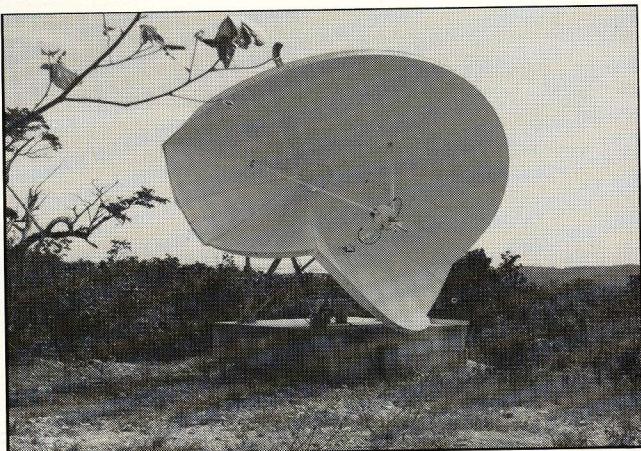


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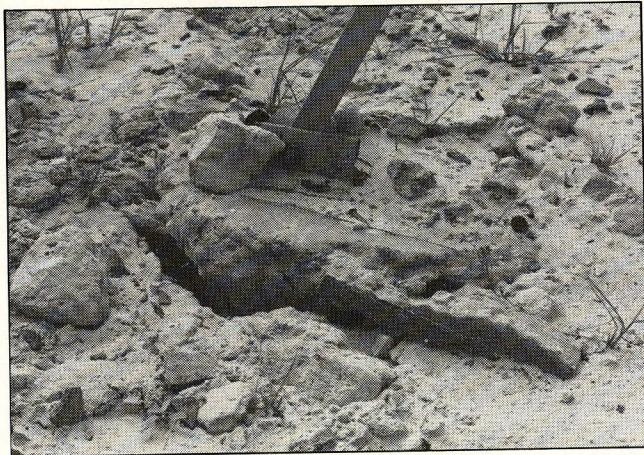
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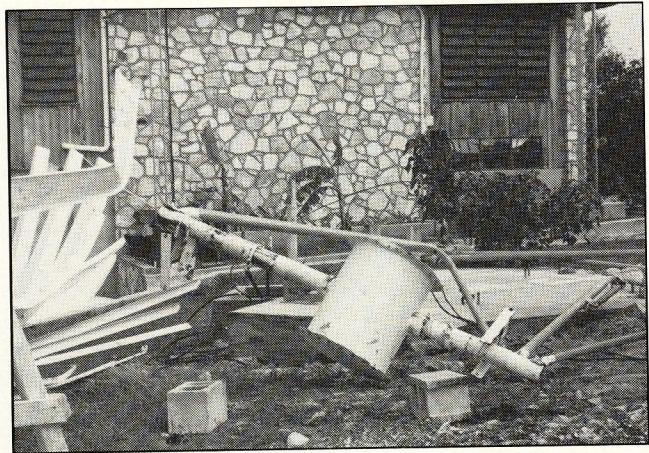
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NOT OFFSET FED/This 20 footer by ADM turned into a giant "Pringle Chip" in Kate's winds. No, it no longer tracks the Clarke Orbit belt!



RAISED ANCHOR/concrete anchor, attached to the WIV-added pole mount brace on Hero 13 footer, lifted 6 inches out of coral sand in storm. The antennas are only as good as their weakest points...



HURRICANE or Tornado? Remnants of ADM 20 footer are scattered downwind from antenna pad after Kate swept over Provo. Needless to say, this dish was a total loss.

mount failed. The mount failures may or may not have been accompanied by actuator failure as well which left the antenna improperly supported in the middle of a hurricane. Damage varied from badly bent panels to broken ribs where the unsupported antennas slammed into solid objects.

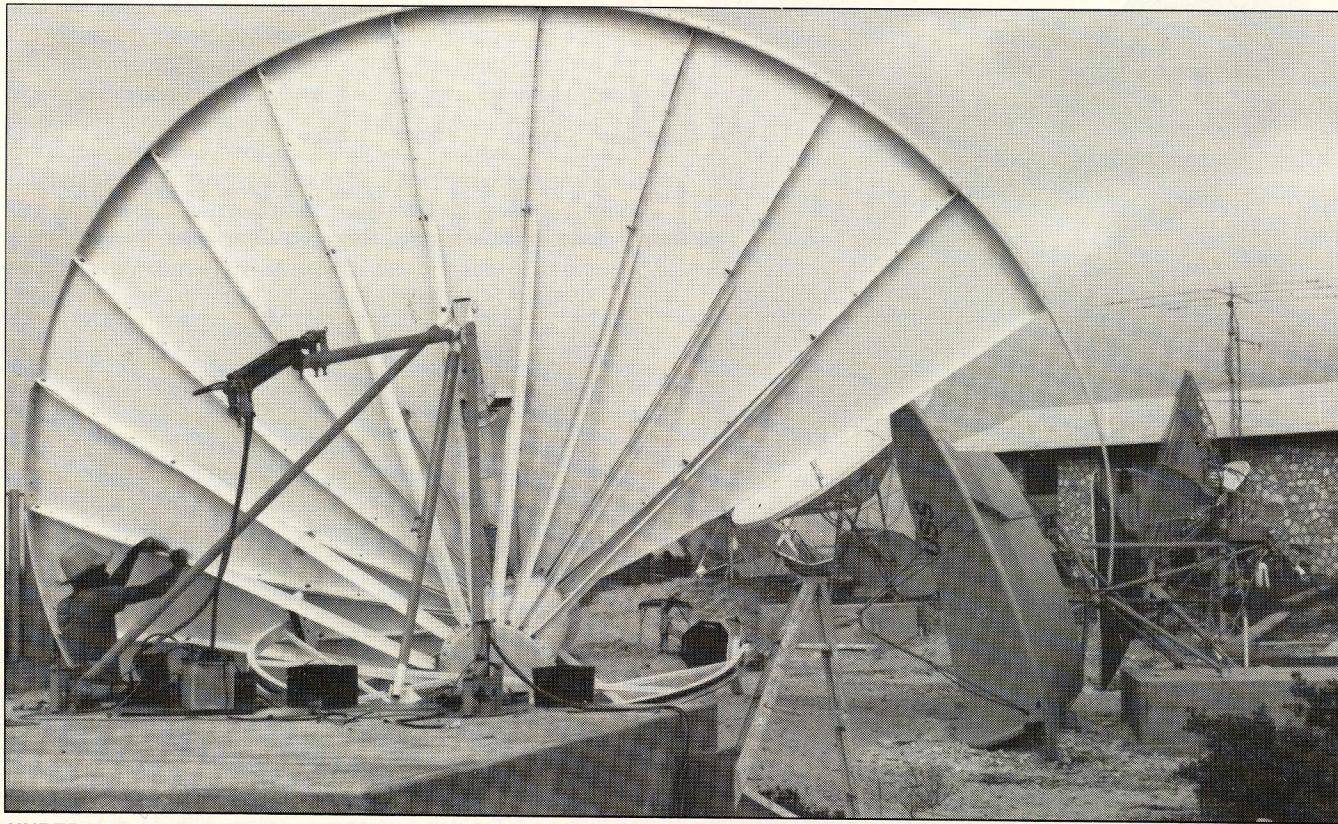
2) Actuator Failures: We suspect that five antennas suffered actuator failure (wind forces ripped the gear teeth out of the actuators after the actuator was driven closed by the wind working on the antenna surface). Antenna damage was slight or not at all.

3) Miscellaneous Observations: One 16 foot USS Fiberglass antenna was destroyed when our poorly selected (Red Head) lag anchors yanked out of the concrete pad leaving the otherwise substantial mount unsupported. The failure of this installation was our error and not the fault of USS; the anchor bolts should have been welded to steel members buried into the concrete pad rather than being simply lagged into the pad proper. One Paraclipse 12 foot antenna, manufactured during a period when Paradigm was not including 'Hurricane Clips' as standard practice on all antennas, lost its actuator. The freewheeling antenna rotated with the wind and beat itself to death. Eight other 12 foot Paraclipse antennas, each with the Hurricane Straps survived with minor damage even though many lost actuator supports.

Three Conifer antennas retained the integrity of their surfaces, their mounts, and their electronics, but lost their feeds. An ECI 11 footer turned upside down on its mount, twisting the mount-to-pole metal pieces into a corkscrew. The actuator arm snapped in the process but the (Seavey) feed, which is quite heavy, and the surface of the dish, as well as the ribs, came through the storm unscathed.

Two Hero antennas were skinned; the sheet-metal-screw applied mesh surface rippled and rolled up into small knots or balls at the center of the dish. The ribs and remainder of the antennas came through intact. (Both of the 13 foot Hero antennas were being operated in a fixed mode; both were anchored, without motor drives attached, on single birds. Bob Behar suggests that if the drives had been attached and the dishes had been in a stowed position - straight up - the mesh would have stayed in place.)

One hurricane does not answer all questions. For years, the common advice has been to stow antennas straight up. We did this. As best we could tell, it made no difference whatsoever. The winds drove the dishes to their most westerly angle position, dragging the linear or horizon-to-horizon actuators along with them. Looking back, stowing the antennas directly into the storm might help since it would take the wind longer to drive them straight up and to the most westerly position before the antenna drives ran out of travel room. Remember, we found the linear actuators, in particular, eventually broke loose from the antennas (either physically breaking loose or having their gear trains stripped out), and at best, they acted as brakes for some period of time. Securing the dishes so that they would not freewheel back and forth after (not if) the actuators break free seems like a good hurricane precaution for future reference. Ground anchors that would allow you to tie-off the dishes in a stowed position which prevents the



UNDER DESTRUCTION 20 foot ADM is being disassembled after being blown off of pad (left) and deposited on coral ground adjacent to pad. USS 16 footer (right of center) was also ripped off of its pad and crushed on coral (see text).

dishes from wind-run-away also makes sense to us for future reference since it is clear that wind driven dishes are a major cause of ultimate antenna damage.

We also thought that if you take a 3 or 4 or 5 inch piece of pipe and fill it with concrete, allowing the concrete to harden and stiffen the pipe, you will add considerable strength to a pipe mount. Not true. Calculations suggest that if you fill a piece of pipe with concrete, you are gaining between 10 and 12 percent additional pipe-stand strength at the most. Pipe filled with concrete tended to split along vertical seams or where stresses simply made seams. Concrete filled pipe was ultimately not measurably stronger nor more resistant to wind collapse than pipe left alone. We won't bother filling any more pipe with concrete in the future.

Some Uniden 10 foot 7 inch dishes were particularly surprising. They use a slide-in type of mesh surface with channels in the ribs to accommodate the mesh panels. Many other suppliers use this general approach and we've listened politely as antenna designers have claimed at trade shows that these slide-in panels will merely pop out if the wind gets too strong. The suggestion has been that you may lose panels but you will not lose a dish super-structure with such antennas.

Not one panel came out of such a dish. If a 105-110 mile per hour wind for 4.5 hours won't pop a panel out, we doubt you will pop panels. In fact, the Uniden dishes survived with only minor feed support damage (aside from actuator arms that bent or broke; a separate problem traceable not to Uniden but to the actuator people). Do panels pop out? We doubt it. At least not in Hurricane Kate.

Several actuators did fill up with sand and wind driven salt water. Yes, they had boots on them. You almost need to experience the penetrating force of 100 mile per hour winds driving tons of wet sand loaded down with salt water to appreciate what happens here.

"We tied ourselves to the dishes with rope to keep from being blown across the yard," remembers Marshall Foiles. "John (Ramsey) would try to fit a large wrench to the nut and I would try to get another large wrench to the head of the bolt. After just a half minute or so, our bodies were a mass of raised welts from the wind driven sand. I've heard of sandblasting but I have never felt it before. I am really surprised there is anything left standing after that storm!"

Fences, tile roofs, and sides of buildings disappeared. Wet sand was falling out of crevices, nooks, and crannies for weeks after the storm. It was no wonder that some actuators, located on dishes close to Provo's beaches, simply filled up with gunk and never worked again.

"Fittings sealed with Coax-Seal stayed tight while some others, including those taped up, simply disappeared. There are tremendous pressures at work in a storm like this; people have no idea how bad it really is. I have lived here (on Provo) for six years and I always thought it would be fun to go through a hurricane. That was it; the next time there is a hurricane, I am going to join Coop on the last plane out. One is enough for a lifetime!"

Other System Damage

West Indies Video operated seven television transmitters, an FM broadcast transmitter, a two-way radio repeater, a 25

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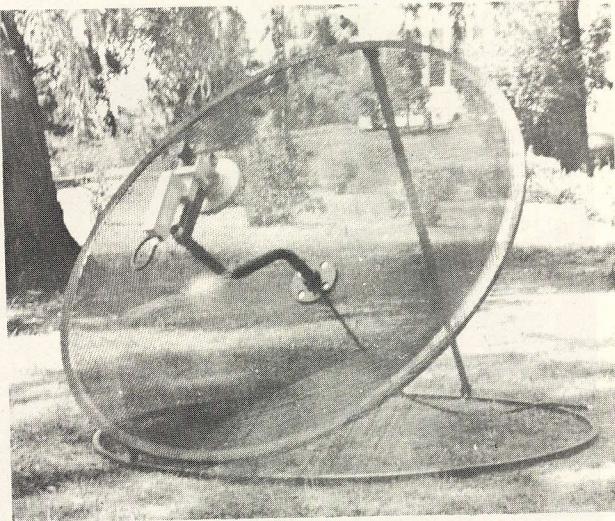
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F/D 5' = .36

F/D 6' = .30

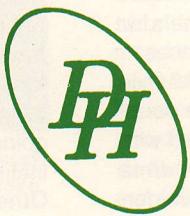
WEIGHT:

5' SDR = 40 lbs.

6' SDR = 53 lbs.

5' PDR = 39 lbs.

6' PDR = 52 lbs.



DH Satellite

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channel cable television system, and the R and D Lab on Provo prior to the storm. The satellite antennas, all 25 of them plus another 15 on the island which WIV had installed for others, were common to most of the services. The loss of dishes put virtually everything off the air. Foiles managed to get four cable channels back on the air with temporary or broken antennas within four days, and he had the FM station on the air 60 hours after Kate plowed through. Within a week, the first over-the-air broadcast TV channel was back in service. It would be months before all service was restored to its original operating condition, however.

A 150 foot (Rohn 65G) broadcast tower, laced with several dozen transmitting antennas, survived intact. Only a handful of the rugged tower mounted Yagi and log antennas were lost in the storm, although satellite dishes at the base of the tower folded up like accordions. A small 30 foot tower, holding one end of a 23 GHz terrestrial microwave link between the tower site and the antenna farm at Grace Bay, leaned badly, and the terrestrial microwave path was lost until the tower was replaced.

The cable TV system, newly constructed this past fall, suffered major damage. Using integrated (figure 8) $1\frac{1}{2}$ inch self-messengered trunk cable, virtually every splice, amplifier, passive entry, or exit fitting pulled loose in the winds. Getting the cable system back into operation involved redoing virtually every cable fitting in the plant, a process that required a week's time. Trunk amplifiers were blown clearly off of poles and were discovered laying in the bush at the bottom of poles. One stretch of utility poles, supporting cable TV as well as power and telephone lines, saw 21 poles snapped off at their bases. In a situation such as this, everyone pitches in and helps clean up the mess; getting power restored for island residents had top priority so the cable TV crew went to work removing downed utility poles and lines to get the major utility services back in place before the cable TV lines were addressed.

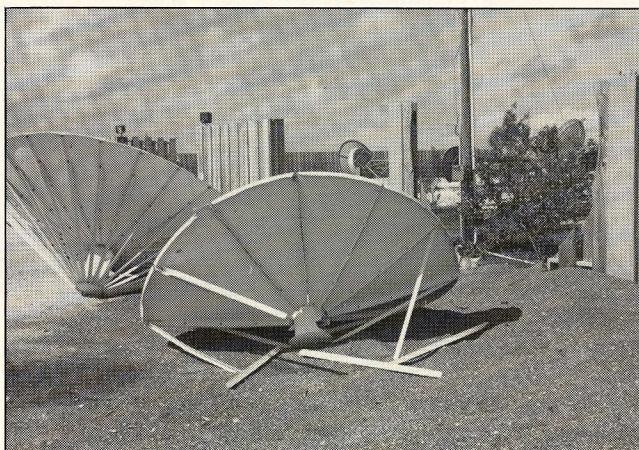
Synopsis

Hurricane force winds are dangerous to satellite antennas. Dealers living and working in areas where hurricanes are possible should reconsider their installation practices. Mesh antennas with properly designed horizon-to-horizon mounts proved their superiority on Provo during Kate. Antenna mounts, whether pole or three legged, are only as good as the method used to attach the mounts to the ground or pad(s). Feeds must be guy-wire supported if they are going to survive such storms intact. Pole mounts should be braced (such as the Paraclipse 9 foot CD series antenna) if you want to be sure the antenna does not cave in at the mount proper.

Filling pipe (mounts) with concrete is a waste of time in most situations; you are far better off spending the same money and time bracing the pole back to the ground with three rugged support legs. Stowing the antennas straight up proved ineffective; we suggest stowing them into the wind so the drive has further to be shoved by the wind before it runs out of maneuvering room and ultimately is forced to crack open or bust off by the winds. Any dish that does not have a hurricane safety strap should have one added as an accessory option to insure that when (not if) the actuator arm busts loose, there is something in place to help the dish when it flops from side to side in the winds.



NOSE JOB/ 12 foot fiberglass, 16 foot USS fiberglass, and 20 foot ADM all ended up on their noses after Kate's 110 mile per hour winds ground them down.



NO LONGER STANDING/ ADM 13 footer and 11 footer lay when Kate finally let them go, on ground in front of WIV fence. Holes in fence were Kate-made; before storm, fence line was intact.



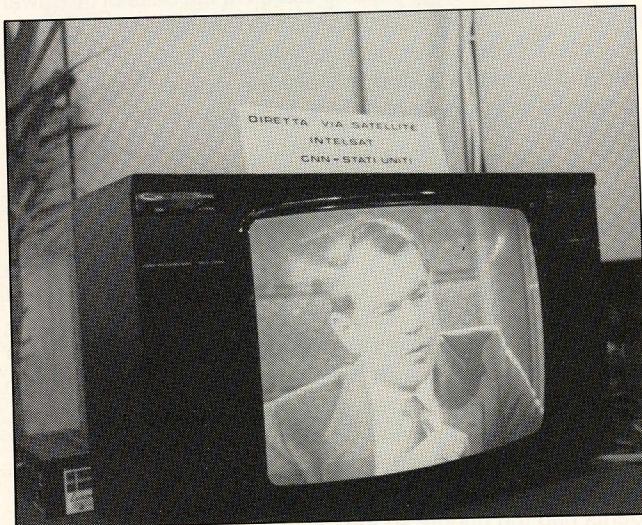
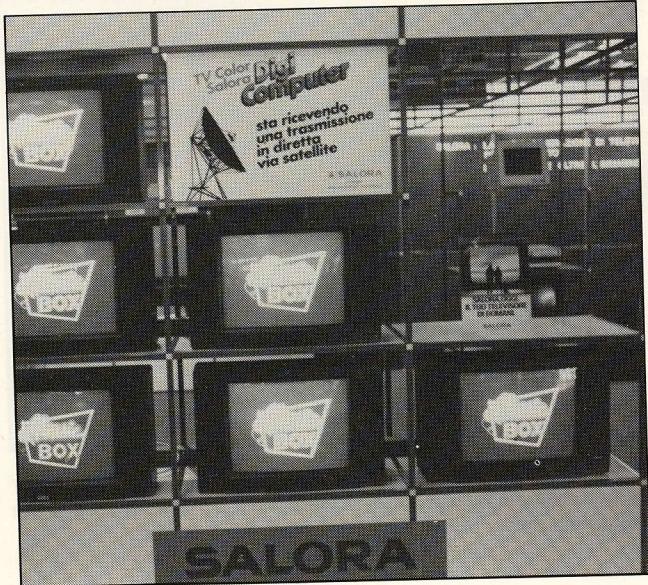
UTILITY POLES all over Provo sheared off at their bases or leaned over close to ground, suspended (as this one) only by the still intact power lines.

TVRO Progress in Europe

by Peter C. Sutro

Florence, Italy, is known as the cradle of renaissance art and culture, having spawned such giants as Michelangelo, Leonardo da Vinci, Dante, and Galileo. It is the last place that one would expect to find an electronics show featuring satellite earth stations. Yet that is exactly what took place on October 18, 1985, in the Palazzo dei Congressi of the Fortezza da Basso on the outskirts of this beautiful and historic city. The show was officially known as RIAFF 85, "Rassegna delle Apparecchiature Hi-Fi, Car Stereo, Videoregistrazione, Televisione, Computer e loro accessori."

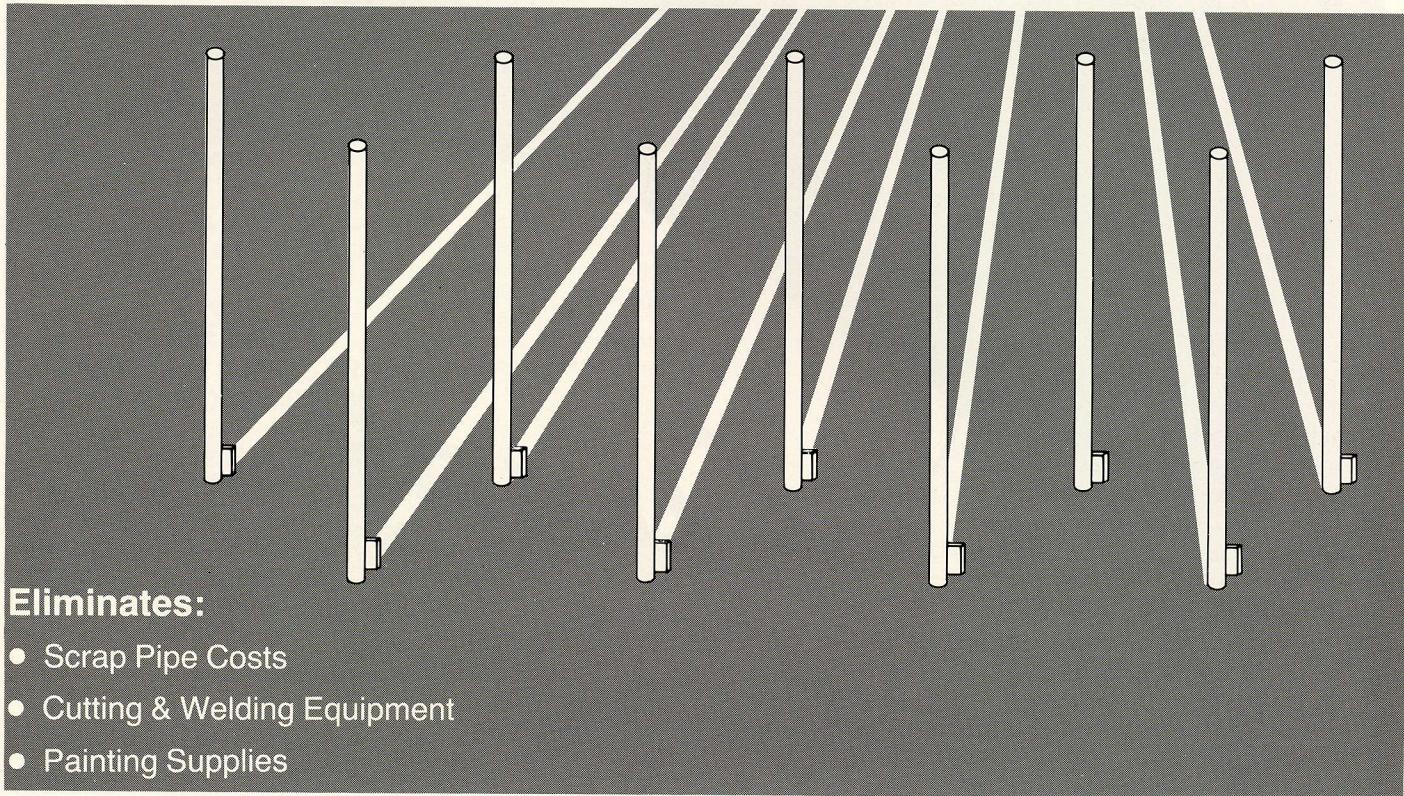
The fortress was built in the 15th century and was used by Florentine and later by Italian armies and now houses a variety of schools as well as a fully-equipped exhibition hall. This particular show featured, along with TV sets, computers, hi-fi equipment, and video tape recorders, seven satellite antennas ranging from a 3 foot C-band dish aimed at the Soviet Ghorizont satellite to a 10 foot Ku-band dish receiving signals from Eutelsat I-F1, which carries Music Box (the popular British clone of MTV) as well as various news, entertainment, and religious programming from West Germany, France, Belgium, Norway, Italy, and the Netherlands. The star of the show, however, was a 6 foot antenna receiving the newly-launched Ku-band service on Intelsat VA-F11, bringing CNN to the European continent.



It was this CNN service which elicited the most interest among exhibitors and the public, for it will enable hotels as well as the tens of thousands of Americans living in Europe to receive immediate, around-the-clock news from home on relatively small dishes at a low cost. The footprint of the CNN service on 6 foot antennas appears to spread from Scotland in the north to the coast of North Africa in the south, and to cover in an east-west direction all the western European countries and even the Middle East (perhaps needing 8 or 10 foot antennas in the fringes).

What this means to luxury hotels whose clientele is at least 50% American (or at least English-speaking) is the ability to offer to their guests a very valuable amenity and to the backyard dish owner the ability to keep in touch with world news as it happens, in a language he can understand, and with a slant that is American and not filtered through some European government's censorship. CNN, of course, wants to be paid for the service and has every right to collect. However, the apparent danger is that they will make the encryption system so expensive and complicated (i.e., subject to technical failure in areas where service is difficult, at best) that it will defeat their purpose. It appears to me that a very secure audio encryption system would suffice to render the service worthless to a would-be pirate. Fees from hotels and private individuals coupled with advertising revenues could make this one of Ted Turner's more successful enterprises.

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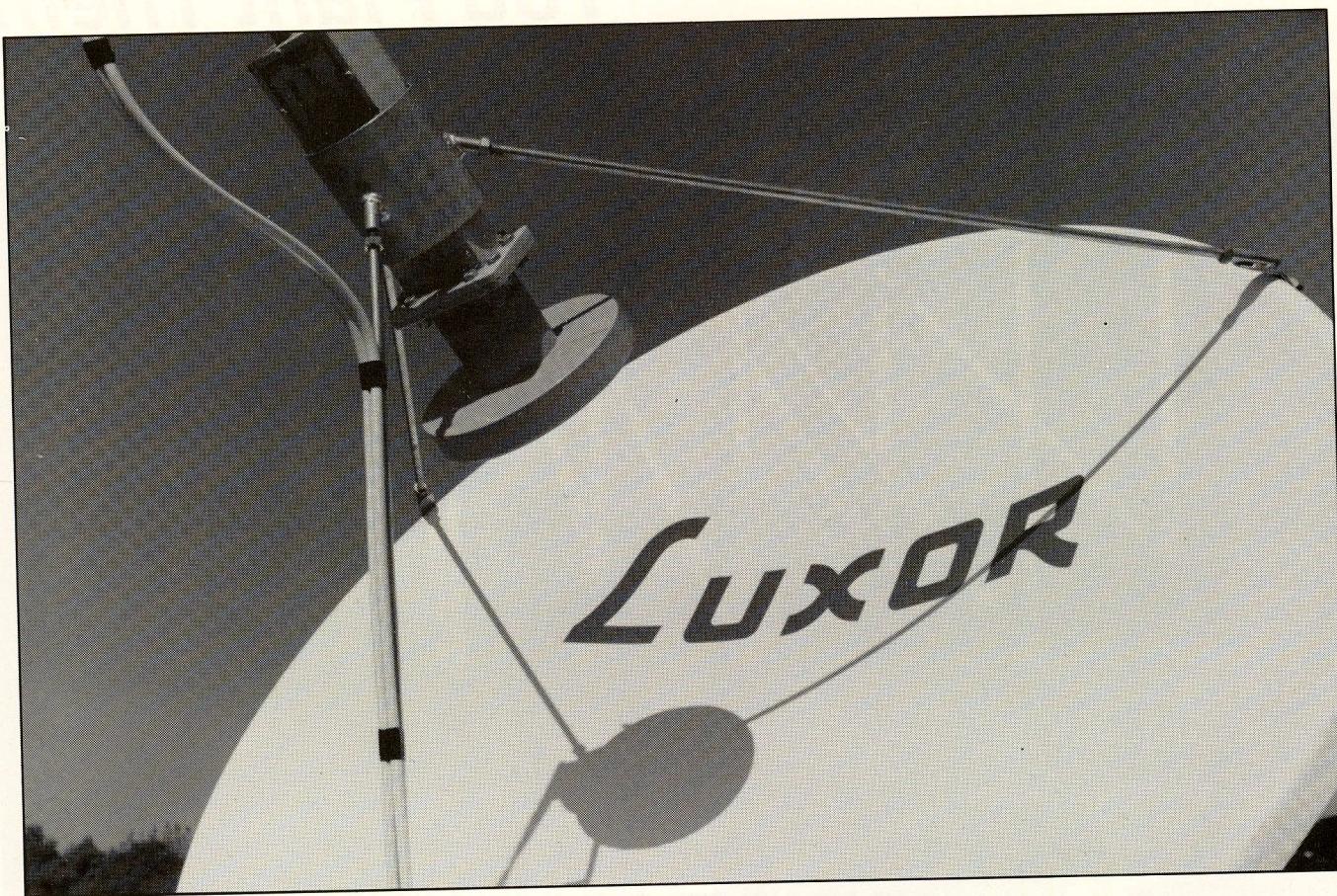
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The most interesting booth at the show featured Luxor products in a side-by-side demonstration of live downlinks showing the US (CNN), Soviet (Ghorizont), and Western European (Eutelsat) news feeds. It proved to be an impressive demonstration of Arthur Clarke's theories of world communications. Let us hope that more international programming will soon become available in countries around the world, so that people will get to know and understand one another better.

The future of western European satellite television appears to be at about the point at which the USA's was about four or five years ago. The one important difference is that they will not have to go through the agonizing and expensive trial and error process to which our industry was subjected. The Europeans know what they want and that includes state-of-the-art equipment, infrared remote controls, stereo sound, super-low temperature LNBs, and very accurately made dishes. It is not a case of being able to foist off junk on the new European market. There should be good opportunities for some US manufacturers to enter a potentially vast market. A modification of a satellite Ku-band compatible receiver to give it an 800 MHz wide IF would be gobbled up in Europe today if available. One US manufacturer, the Stolle division of Alcoa, is already positioned in Europe with its 6 foot (1.8 meter) antenna available in warehouses in Britain and the Netherlands.

I would dare say that their products will become the standard on the European market, especially with extender panels (to 8 feet) and their capability in the 1.2 meter and smaller antennas.

The most important satellite show in Europe in the next six months will take place in Basel, Switzerland, from February 11 to 13, and I would urge any US manufacturers interested in this burgeoning market to attend even though it is very close to the Las Vegas SPACE/STTI show on February 19.

An interesting sidelight of my trip to Italy was the discovery of the expertise of Italian manufacturers in the field of RF. Italy boasts upwards of 40 VHF and UHF broadcast signals in a given area and they have developed tremendous competence in the fields of antenna design and signal processing, including amplification, filtering, and modulation. An example is an excellent, crystal-controlled modulator of commercial quality which is extremely temperature stable and has excellent adjacent channel rejection characteristics which could be imported and sold profitably in the US for under \$150. If anyone is interested in learning more about these products, I can be contacted at (201) 766-4408. With the cost of quality commercial grade receivers now below \$500, imagine what the addition of a \$150 modulator does to the cost of a five satellite channel SMATV head-end. The entire cost including installation would be under \$5,000, making it affordable to apartment buildings where the pay-TV penetration projections were under 50 subscribers.

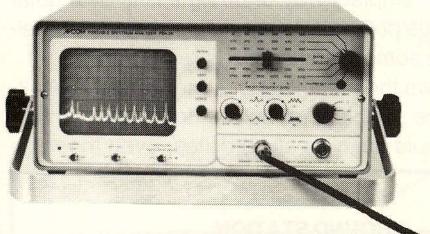
In conclusion, I would recommend that US manufacturers take a long look at the opportunities available in Europe both for export and import.

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AVCOM's COM-3(R) Series of reliable Satellite Receivers features 24-channel detented tuning, APS-24 (automatic polarity switching), crystal controlled modulator, unclamped video output for decoders, tunable audio (4 to 8 MHz) with wide and narrow IF bandwidth, sensitive signal strength meter, excellent threshold sensitivity, scan-tune circuitry, and internal DC power block. The COM-3 features a convenient remote control unit for ease of operation. The COM-3(R) Series is among the best performing Satellite Receivers available for weak signals and excellent video reception.

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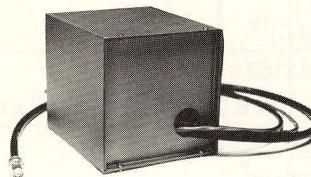
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Jamaican 7-Meter Dish

Part III

by Hugh G. Brand

The Mount

The geosynchronous satellites always remain in the same position in the sky relative to the observer. This occurs because the satellite is placed in an almost perfectly circular equatorial orbit. Its altitude is such that its orbital period exactly matches the rotation of the earth, i.e., 24 hours corresponding to an altitude of about 35,800 km (22,245 miles) above the Earth's surface. Consequently, it is necessary to compute only one set of azimuth and elevation angles in order to position an antenna for a given synchronous satellite. This task can be easily accomplished in a few seconds on a pocket calculator with trig functions. The method is shown in Appendix 3:1 for satellite Satcom F3R to Kingston, Jamaica. This shows that the azimuth angle A to Satcom F3R, is 257.44°. The elevation angle is 25.98° and the slant height is 38989 km.

Knowing where the satellite is, is the first point. The next problem is to locate it in as simple manner as possible and also to locate the other in a similar manner. In other words, to track the satellite belt. The simplest way of doing this is by a polar mount. However, a true polar mount would look over the satellite belt and therefore some modification is required.

Appendix 3:2 shows the modified polar mount due to Walter, Reference 1. The principle of the method assumes that the perfect mount would align on all satellites; even those on

Appendix 3:1
CALCULATION OF AZIMUTH/ELEVATION ANGLE/SLANT HEIGHT
 for
 SATCOM F3R - 131°W
 from (18.027°N 76.76°W)

$$a = 18.0266$$

$$g = -76.75986$$

$$R = 6367 \text{ km}$$

$$L = 35800 \text{ km}$$

$$b = (g - f) = -76.75986 + 131 = 54.24$$

$$C = \cos^{-1} (\cos 54.24 \times \cos 18.0266)$$

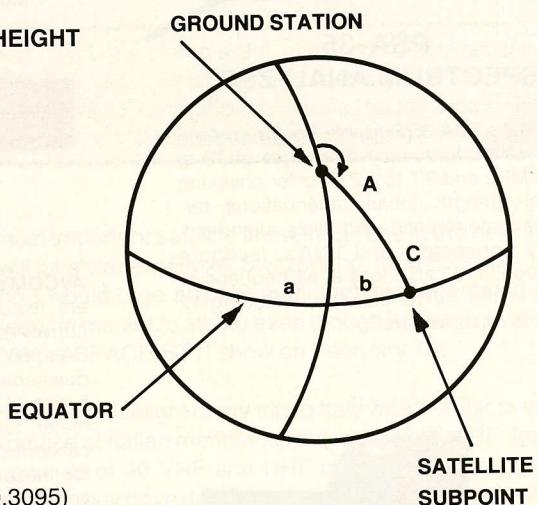
$$= \cos^{-1} (0.5844 \times 0.9509) = \cos^{-1} (0.5557)$$

$$= 56.24^\circ$$

$$\begin{aligned} \text{Azimuth Angle } A &= 180 + \tan^{-1} (\tan b / \sin a) = 180 + \tan^{-1} (1.3886 / 0.3095) \\ &= 180 + \tan^{-1} (4.4872) = 180 + 77.437 \\ &= 257.44^\circ \end{aligned}$$

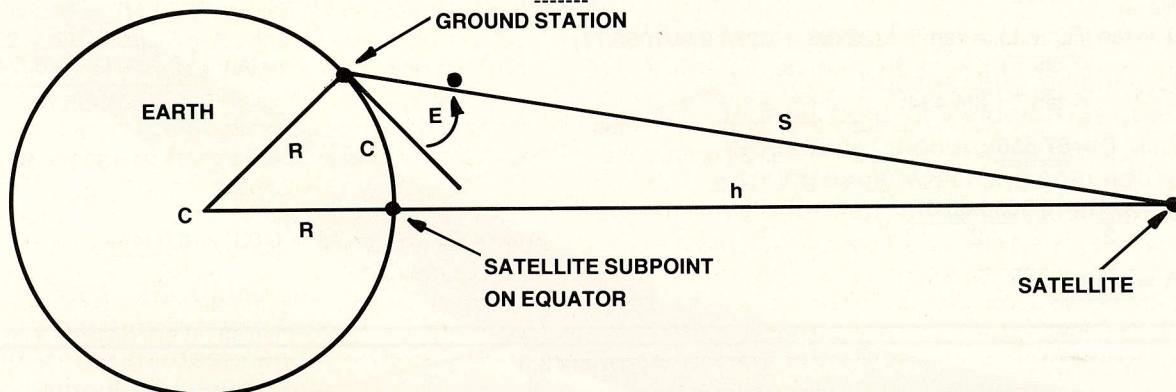
$$\begin{aligned} \text{Slant Height } S &= [R^2 + (R+h)^2 - 2R(R+h) \cos C]^{1/2} \\ &= (6367^2 + 42167^2 - 2 \times 6367 \times 42167 \times 0.5557)^{1/2} \\ &= (6.367^2 \times 10^6 + 42.167^2 \times 10^6 - 2 \times 6.367 \times 42.167 \times 10^6 \times 0.5557)^{1/2} \\ &= 10^3 (4.054 \times 10 + 1.778 \times 10^3 - 2.9839)^{1/2} \\ &= 10^3 (1.52)^{1/2} = 38989 \text{ km (24227 ml)} \end{aligned}$$

$$\begin{aligned} \text{Elevation Angle} &= \cos^{-1} \frac{[S^2 + R^2 - (R+h)^2] - 90}{[2R_s]} \\ &= \cos^{-1} \frac{[3.8989^2 \times 10^8 + 6.367^2 \times 10^6 - 4.2167^2 \times 10^8] - 90}{[2 \times 6.367 \times 10^3 \times 3.8989 \times 10^4]} \end{aligned}$$



Appendix 3:1

$$\begin{aligned}
 \text{Elevation Angle} &= \cos^{-1} \frac{[1.52 \times 10^9 + 4.054 \times 10^7 - 1.778 \times 10^9]}{4.964 \times 10^8} - 90 \\
 &= \cos^{-1} \frac{[152 \times 10^7 + 4.0539 \times 10^7 - 177.8 \times 10^7]}{[2 \times 6.367 \times 10^3 \times 3.8989 \times 10^4]} - 90 \\
 &= \cos^{-1} (-0.438) - 90 \\
 &= 115.98 - 90 = 25.98^\circ
 \end{aligned}$$

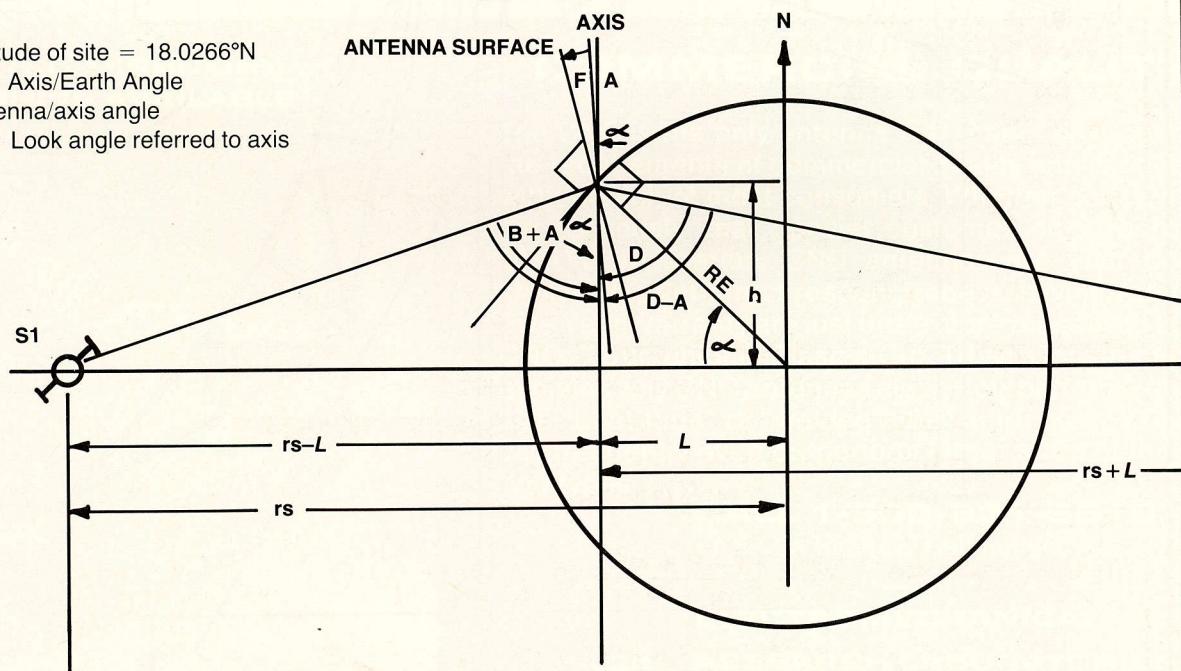


the far side of the Earth. If the antenna is tilted on its axis and the axis is also tilted in respect to the polar axis we get a modified polar mount shown in the figure. Rotating the antenna on its axis will trace a conical surface, but the intersection of this

conical surface with the equatorial plane will be an ellipse because the axis is not perpendicular to the plane. This shows that we still do not have a perfect mount since the satellite belt is circular. However, if it is shown that the error in tracking is

Appendix 3:2
Modified Polar Mount
for
Latitude 18.0266°N Longitude 76.75936°W

a = Latitude of site = 18.0266°N
 $a + A$ = Axis/Earth Angle
 F = Antenna/axis angle
 $B + A$ = Look angle referred to axis



Appendix 3:2

let R_E = Radius of Earth = 3444 miles

let R_S = Radius of Satellite Belt = 22,766 miles

h = $Re \sin a = 3444 \times 0.309458 = 1065.775633$

$L = Re \cos a = 3444 \times 0.95091295 = 3274.944201$

$B = \tan^{-1} \left(\frac{R_S - L}{h} \right) = \tan^{-1} \left(\frac{22760 - 3274.94}{1065.77} \right)$

$= \tan^{-1} (18.288)$

$\therefore B = 86.87$

$D = \tan \left(\frac{R_S + L}{h} \right) = \tan^{-1} \left(\frac{22766 + 3274.94}{1065.77} \right)$

$= \tan^{-1} (24.434)$

$D = 87.656$

$A = \frac{D-B}{2} = \frac{87.656-86.87}{2}$

$A = 0.3931$

Axis/Earth angle = $a + A = 18.0266 + 0.3931 = 18.4197$

$= 18.42^\circ$

Antenna/Axis angle $F = 90 - A - B = 90 - 0.3931 - 86.67$

$= 2.74^\circ$

Look Angle = $B + A = 86.87 + 0.3931 = 87.26^\circ$

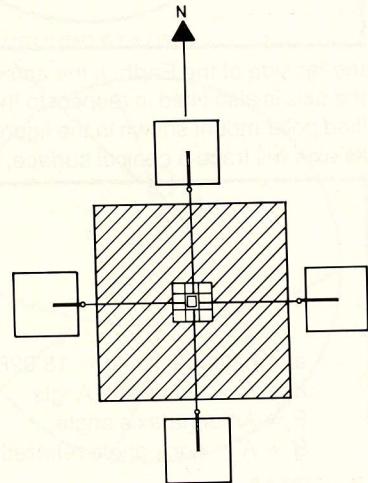
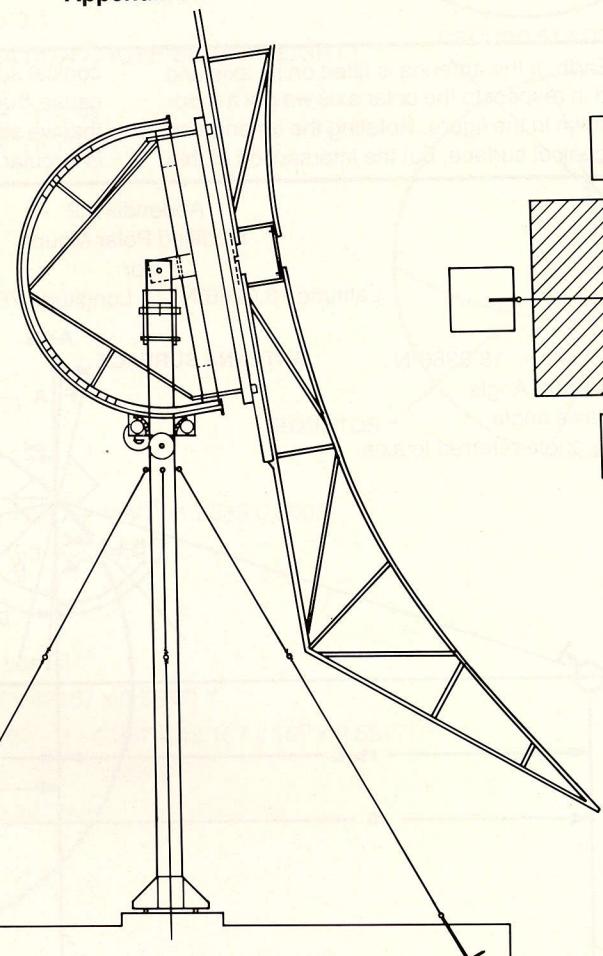
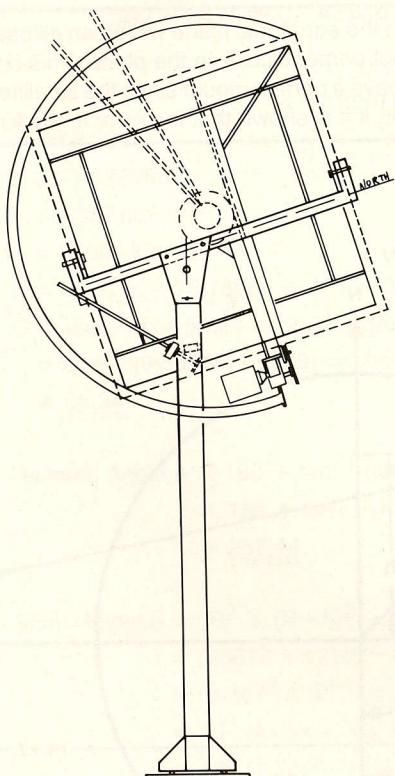
Theoretical Look Angle = $\tan^{-1} \left(\frac{\sqrt{R_S^2 - L^2}}{h} \right)$

$= \tan^{-1} \left(\frac{\sqrt{22766^2 - 3274.946^2}}{1065.78} \right)$

$= \tan^{-1} (21.139) = 87.29^\circ$

Error = $87.29 - 87.26 = 0.03^\circ = 0.034\%$

Appendix 3:3



GENERAL ARRANGEMENT OF MOUNT AND DISH

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Appendix 3:4
CALCULATION OF REQUIRED DRIVE SIZE

Load and Torque W_1 = Weight of rotator, LNA/DC, mounting

= 15 lb

 W_2 = Weight of mesh surface= 4.68×39

= 183 lb

 W_3 = Weight of trusses and support= $(30 \times 15) + 50$

= 500 lb

 W_4 = Weight of steel dish support frame

= 294 lb

 W_5 = Weight of LNA/rotator support legs

= 18 lb

1010 lb D_1 = Distance of W_1 to column centre

= 131 in.

 D_2 = Distance of W_2 to column centre

= 51 in.

 D_3 = Distance of C.G. of dish structure W_3 to column

= 24 in.

 D_4 = Distance of C.G. of dish support structure W_4 to column

= 6 in.

 D_5 = Distance of C.G. of W_5 from column centre

= 81 in.

Torque = $(15 \times 131) + (183 \times 51) + (500 \times 24) + (294 \times 6)$ + (18 \times 18) lb. in.

= 1965 + 9333 + 12000 + 1764 + 1458

= 26520 lb. in.**Appendix 3:4**

Radius of chain guide = 33 in.

Radius of drive sprocket = $2.415/2 = 1.2075$ in.Torque required at output of drive = 26520×1.2075

33

= 970 lb. in.

Rated output torque of gear motor/

(Boston Gear, Cat. No. FWA 321-400-G7) = 1025 lb. in.**NOTE**Drive sprocket changed from 5 in. pitch circle diameter shown on drawing to
2.415 in. dia.**Horse Power Required**

RPM of Motor = 1450 rpm. at 50 Hz.

Gearbox reduction = 400 : 1

∴ RPM of load = $1450/400 = 3.625$ rpm.Output Power Required = Torque \times RPM / 6302563025 = $970 \times 3.625/63025$

= 0.055 H.P.

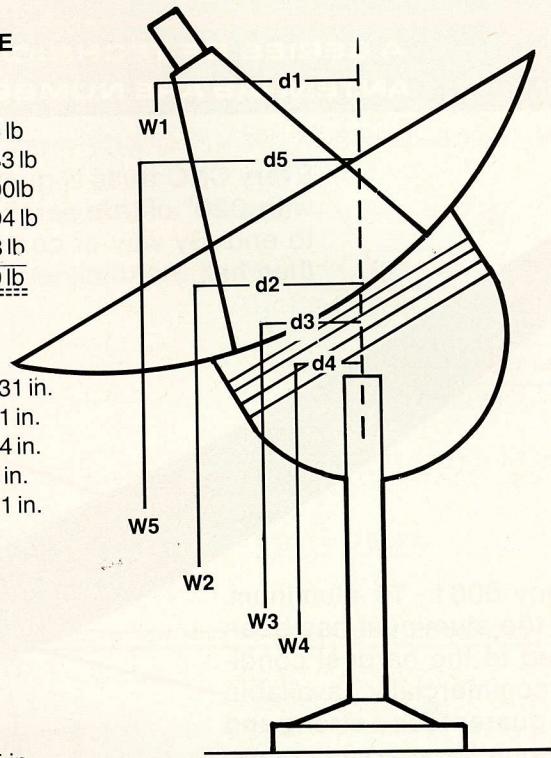
Efficiency of reduction gear drive = 45%

Input H.P. of drive = $0.055/0.45$ = 0.122 H.P. (1/8 H.P.)Rated H.P. of drive motor (Gould Inc. #7-142380-40) = 1/6 H.P.**Time To Traverse Satellite Belt (141°)**

Final speed of drive motor/gearbox = 3.625 rpm

Drive sprocket radius = $2.415/2 = 1.2075$ in.

Chain guide radius = 33 in.

Speed reduction ratio = $33/1.0275 = 27.3 : 1$ ∴ Speed of chain guide = $3.625 \text{ rpm} / 27.3 = 0.13 \text{ rpm}$ Revolution Traversed = $141^\circ / 360^\circ = 0.39 \text{ Rev.}$ ∴ Time to Traverse = $0.39 / 0.13 \text{ (min)} = 2.95 \text{ min.}$ 

Appendix 3:5 SELECTION OF GEARMOTOR

(1) Service Factor = 1

(2) Output speed of drive = (.3 rpm) x (33 in./2.5 in) = 3.96 rpm

(3) Output Torque = $\frac{\text{Required Torque} = 30,000}{\text{Speed Ratio} (33/2.5)} = 2272.7 \text{ lb. in.}$

(4) Preliminary selection from Chart 1:

W321/400 : 1025 in.lb. (0.17 H.P. (in)) 4.4rpm
(0.071 H.P. (out))

W326/400 : 1950 in.lb. (0.31 H.P. (in)) 4.4rpm
(0.14 H.P. (out))

W332/400 : 3900 in.lb. (0.48 H.P. (in)) 4.4rpm
(0.27 H.P. (out))

(5) Final selection from Chart 2:

Gearbox : FW326/300 : 1950 in. 1n. 0.18 H.P. (out) 5.8 rpm
: 1/3 H.P. Type: ER, 110/220V 1 PH. reversible 50Hz
483 rpm (Cat. No EST Item Code 66870)

(6) Maximum overhung load = 1000 lb.

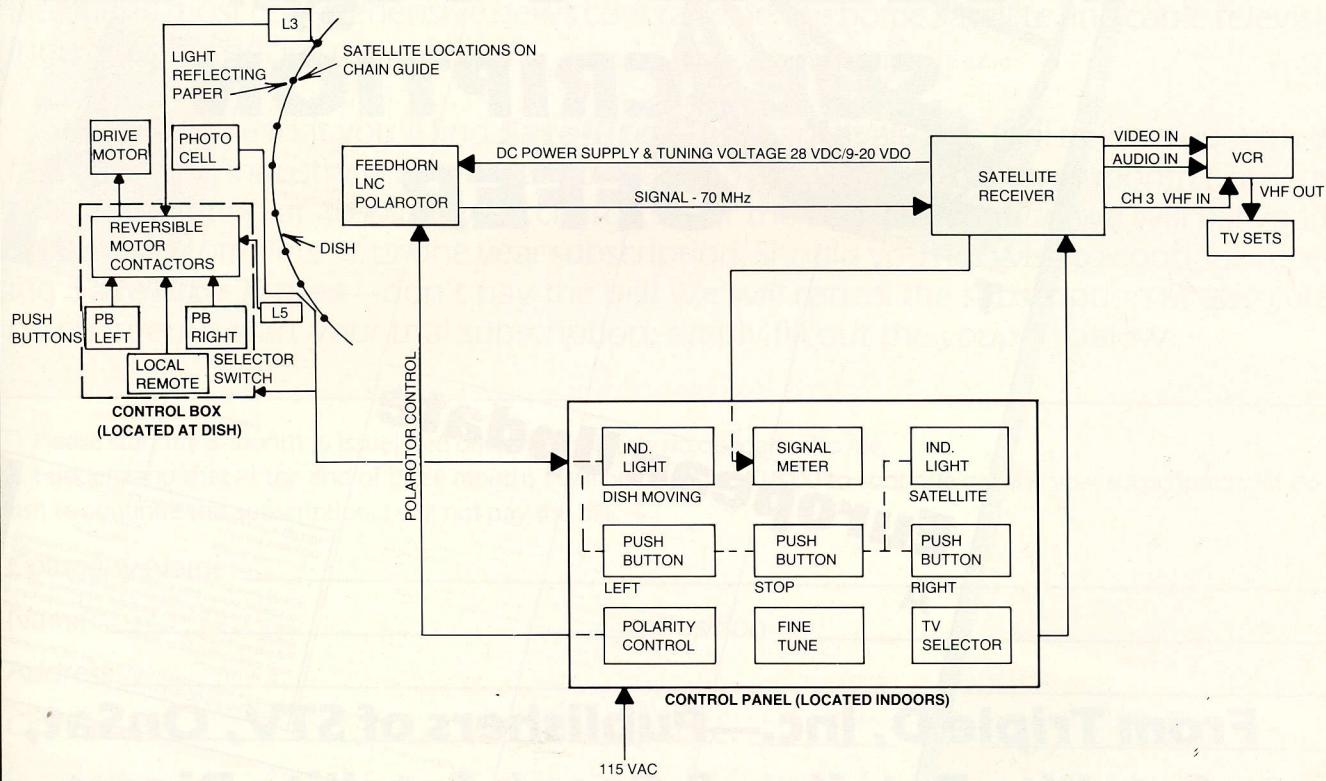
(7) Minimum sprocket diameter = $\frac{2 \times \text{equivalent output torque}}{\text{maximum overhung load capacity}} = \frac{2 \times 1950}{1000} = 3.9 \text{ in.}$

less than the amount by which the satellites themselves drift then we would indeed have a perfect mount.

The important point to note is that the axis is tilted to ensure that look angles to the satellite S1, shown in the figure, and S2 on the opposite side of the Earth are equal. Also, the antenna

axis makes an angle $\alpha + A$ with respect to Earth at our location. The antenna has an additional tilt of F degrees with respect to the axis. The calculations show that at our location the look angle $B + A$ is 87.26° while the theoretical look angle is 87.29° . The difference of 0.03° is less than that which the satel-

Appendix 3:6 BLOCK DIAGRAM OF SYSTEM



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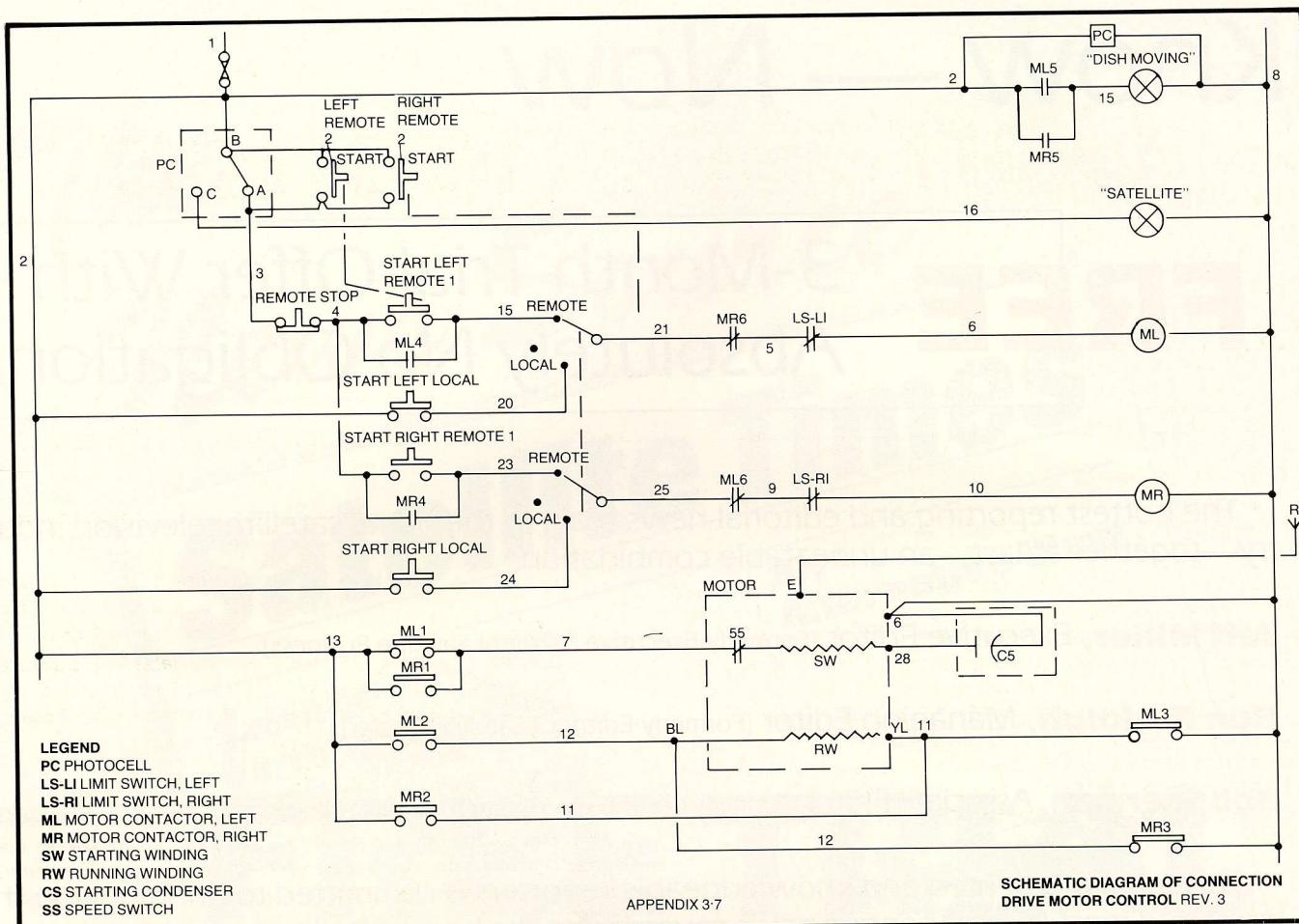
Name _____ Position _____

Address _____

City _____ State _____ Zip _____

Signature _____ Date _____

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lites themselves drift which is about 0.1° . Thus the modified polar mount has the following features:

- (1) Requires movement on only one axis, therefore only one motor is needed to automate.
- (2) Sees the entire satellite belt with an error less than the inherent error of the satellite position itself.

Angle F is sometimes referred to as the offset angle.

When correctly set up, this mount allows us to track the entire satellite belt from Satcom F5 in the West, to Gorizont 2 at 14° West in the eastern sky. The general arrangement of the mount is shown in Appendix 3:3. This has a 400/1 reduction gear driven by a 1/6 horsepower motor as shown.

Appendix 3:4 shows the method of calculation of the required drive size. This shows that the torque required at the output of the drive is 970 lb/in torque.

Appendix 3:5 shows the selection method for the gear motor. Although this worked out theoretically to be the FWA 326-400 when engineering factors of safety were taken into account, the smaller size W321/400 was selected and has been in use for over two years.

There are, of course, other methods of driving the antenna, some of which utilize hydraulic actuators which are common to those systems which track the North American zone only. Those systems which track from horizon to horizon are better facilitated by the motor type drive.

The system uses a photocell to sense the locations of light reflecting paper which are located at points along the move-

able chain drive in the positions of satellites. These positions are pre-determined and located on the chain drive, such that when the light from a photocell is reflected from these markers, a relay operates. The relay is used to stop the motor.

Appendix 3:6 shows a block diagram of the present control system. Although operated by contactors, it is still a manual system, in that, the drive stops at each position at which a reflecting paper is located and does not sense the position of the desired satellite. A design is being worked out which will automatically head to the position of the desired satellite.

Appendix 3:7 gives a schematic diagram of the connections of the drive motor. Two (2) sets of push buttons are provided; a local one to the dish which provides for local movement for adjustment purposes, and the remote set which allows control from a distance.

REFERENCES:

Reference 3:1 'Locating Geo-synchronous Satellites'

Taken from: QST (March 1978)

Reference 3:2 'Polar Mount For All Seasons.'

Taken from: Coop's Satellite Digest. (April 1981)

(Ronald Waltner)

Correspondence

CSD provides this industry Forum with the understanding that opinions, thoughts, and "facts" published are from the writers; no liability for statements extends to the publishers. Address letters to CSD/Industry, P.O. Box 100858, Ft. Lauderdale, FL 33310.

Disgruntled Dealer

In my opinion, the Uniden, DX, and Panasonic products behave as if they were designed in a dreamland. For example, the DX600 cannot produce clear audio during any multiplex broadcast. The Uniden 6000 and 7000, in my opinion, are fire hazards and should be recalled, every last one of them. The Panasonic subcarrier detector cannot pick up a single subcarrier properly and they should align the video demodulator on a live video signal; we had to align each of these receivers for decent video. With our first 50 systems, we are averaging two-plus service calls per system to correct for OEM screw-ups. We don't get paid for these service calls. We only receive updating and modification information (and the occasional parts) after screaming loud and long on the long distance telephone. You can be sure that in the future I will be exercising extreme caution when I select new products to carry as a dealer.

I feel that the dealers, SPACE standards totally considered and set aside, must somehow find a source for honest, factual, product by product evaluations. I know we have talked about this for years and we still rush out like sheep being led to slaughter when new products, backed by great hype, come onto the marketplace to indulge ourselves in another trial by error.

John Grayson
Your Earth Station Co., Ltd.
Duncan BC V9L 3Y1
Canada

New products always have shake-out periods and we try to avoid CSD testing of products until they have been through at least the initial production woes. Coop comments on the SPACE standards package in his Comments section this month.

Hurricane Damage Report

We were interested to read in October's CSD about the Jim Towers expertise here in our area. Our store is also in the Clearwater/St. Petersburg region and we have been doing installations using the 10 foot Seabreeze mesh dish. I agree entirely with Towers' suggestions that the quality of the installation is the key to being a success in this business. We did not, however, experience the same category of hurricane problem(s) which Towers reported in CSD even though we were located in the same general area.

Our problems were dish realignment; several spun free on their pole mounts, and we had to realign the dishes and replace cables. Frankly, we were upset that we had to go back and do any rework at all. I guess, after reading the report of the damage which Towers' dishes

sustained, we should have been grateful that our dishes did not have similar problems.

Frank Brown, President
S.O.S. Satellite Systems, Inc.
Pinellas Park, FL

As the hurricane report for Kate in this issue relates, where a dish is located can have a big impact on how it survives. Towers reported that dishes close to the coast suffered the greatest damage while those inland, even a mile or two, had markedly less damage.

Rally Conspiracy?

Congratulations to those responsible for the Washington Satellite Earth Station Day rally late in October, and those responsible for the telecast which many of us were able to watch and follow. This letter, however, deals with Viewer's First which still makes me uncomfortable.

Frankly, I worry that we are being set up by some very clever people. It bothers me that if we are successful in gaining a two-year moratorium from Congress, we have just guaranteed that our illustrious and ever growing SPACE staff and their legal people will have another two years to collect large salaries and get fringe benefits from our industry. It also bothers me that they have no stake in this except to prolong the battle since their only real remuneration comes in the form of salaries and expense accounts. There is no incentive here for the people we place our total confidence in to expedite this problem.

Viewer's First wins if it somehow gets off the ground and starts collecting money. Some of the people involved with Viewer's First will win if it never gets off the ground. In other words, they cannot lose; and that bothers me.

I believe that the grassroots appeal and backing of TVRO is being lost to a handful of professionals whose primary aspiration is to keep us stirred up, angry, and threatened by one form of disaster or another. As long as we are constantly under fire, we are too busy to evaluate whether we really need all of these people and all of these salaries.

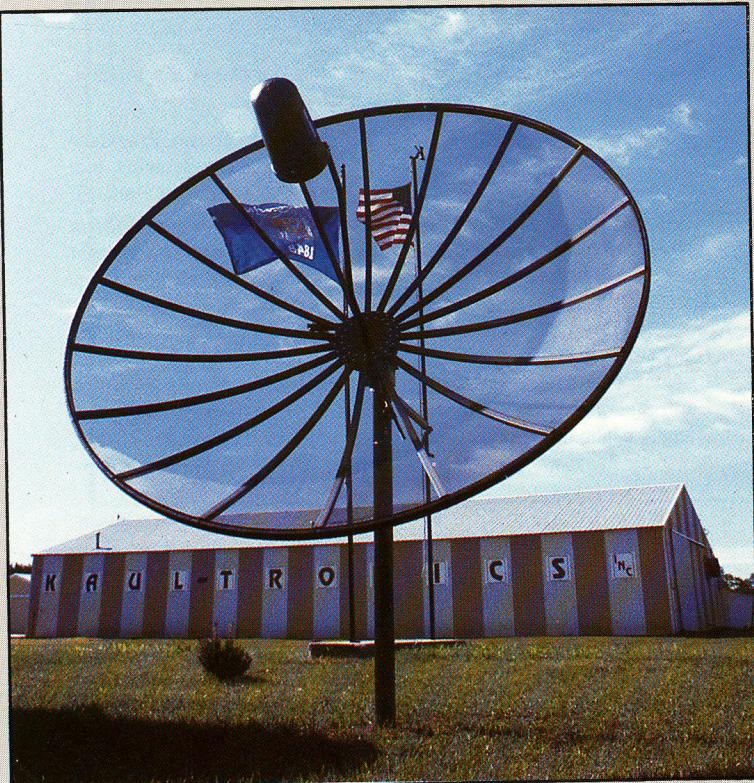
Henry Guerin
New Mexico Satellite
Santa Fe, NM

A trade association is always a self-perpetuating affair. You have to accept that some 'make work' is part of the arrangement. The job of the elected members of the industry who serve on the SPACE Board of Directors is to insure that there are as few 'pork barrel projects' as possible and that there are no major conflicts of interest between staff members and the objectives of our trade association/industry. At the moment, that seems to be well in hand.

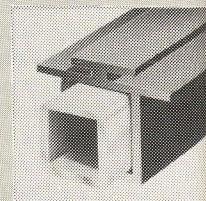
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RCA Ku-1 bird, launched after Ku-2, may be an important player in future growth of TVRO marketplace. Significant cable industry interest in taking 8 to 12 transponders for use to distribute scrambled programming to 3 and 4 foot dishes may see public announcement shortly.

LAUNCH of RCA Ku-2 was self-insured; RCA found insurance rates, after recent satellite losses during launch phase, prohibitive and took chance by sending bird up without insurance; a first. Insurance rates climbed more than double during 1985 and are now so high as to put a damper on immediate term future launches.

ARIANESPACE, European launch group, offering satellite owners reduced insurance rates as enticement for use of Ariane launch services. NASA had previously announced a free relaunch policy to try to keep satellites moving on shuttle missions.

ONE serious proposal for insurance industry is to set limits on amount of insurance for entire shuttle load; such as \$100M. Theory is that individual satellite failures would be separate and not as a group provided satellites being launched were of differing designs and manufacture.

TOM ROGERS, Senior staff counsel for House subcommittee for telecommunications, predicting that neither of pending house bills dealing with home TVRO industry will be adopted during 1986. Rogers says that hearings of the subcommittee will focus on three areas: pricing, compatibility of consumer hardware, and the control of programming distribution. No date has been set for the hearings as of mid-December.

BRISAT has created another set of plans for UK DBS using 5 satellite channels in 12 GHz band with EIRPS of 61 dBw (230 watt transponders) at boresight. Plan faces considerable challenges before it is approved.

AT&T, lessor of a pair of Ku-band transponders on RCA Ku-2, may have evolutionary new network of point-to-point business communications in mind. Firm has been asking for bids on thousands of Ku-band transmit/receive terminals in recent weeks, tipping hand to large scale plans.

EUROPEAN Skychannel service may have serious competition by this fall. A group of 15 UK programming firms have formed a company to investigate creation of new satellite delivered super channel to compete with English language programming of Skychannel. The Skychannel service is similar to the WTBS/WGN programming format and is available over much of Europe up to 12 hours per day on ECS-1.

JAPANESE domestic satellites scheduled for launch in 1988 area already selling out of transponders well in advance of launches. Of the 64 transponders to be available on C. Itoh/Hughes satellite pair, 13 channels are to be set aside for cable television program distribution. Balance will be used for non-entertainment video, data, and narrow band communications.

ANDERSON Scientific, Inc., of Rapid City, SD, has been purchased by a consortium of investors. Anderson family members sold their interests in firm pioneered by Keith Anderson in 1980.

CES (Consumer Electronics Show) held just prior to this issue of CSD was scheduled to feature at least one mini-workshop on TVRO retailing. Show barely a month prior to SPACE/STTI show also in Vegas (February 19-21).

UNIDEN dealers will find alternate source for feed system compatible with Uniden equipment at Boman Industries (800/421-2533). Sixty-five degree LNA, Ultra-Rotor package price is under \$100.

FRENCH TDF bird will have three programmers in place with fourth channel still not in place. There will be one English language channel on bird which is set for launch in midsummer this year.

ANZA Expositions will hold second annual SESE show in Portland May 1-3. Expo will be at Clackamas Monarch Hotel with 13,000 square feet of exhibit space and 11 meeting rooms. Details from Diane Agenbroad at 503/398-7032.

CBS and NBC have differing approaches to rapid expansion of satellite news gathering systems. NBC is creating Ku-band system which will ultimately equip each network affiliate with its own uplink,



but uplink will be designed to transmit primarily to NBC headquarters in New York. CBS is breaking USA into sections, creating sub-centers with stations sharing regional news stories via satellite feed rather than funneling everything through New York headquarters.

INTELSAT wants to modify design of new generation spacecraft to improve service to United States. Several satellite operators fear that Intelsat is looking for a backdoor into US domestic and near-domestic marketplace and have filed objections with FCC.

LUXEMBOURG going ahead with plan for 16 transponder, 45 watt satellite to be launched by May of 1987. RCA bird would be essentially Ku-1 and 2 series satellite and would provide service to 3 foot dishes over much of western Europe. Primary marketplace would be quasi-DBS and SMATV/cable programming channels.

INTELSAT may be considering satellite transponders in 30 to 40 watt region in birds to be used for coverage into and out of Europe and North America. Modifications could come to V series birds still being constructed or to next series (VI) birds.

MORELOS B satellite, recently launched by shuttle, will not be used nor extensively tested for up to four years. Satellite has been placed in storage orbit position since it was less expensive to launch bird now than to wait several years when bird will be needed. Disastrous Mexico City earthquake this past summer caused extensive damage to terrestrial satellite uplink and control circuits reducing Mexican readiness for extensive satellite facilities.

RUSSIA plans to add third national television channel to satellite distribution pattern but not at 4 GHz. Next service will be in 12 GHz band and Gorizont class birds at 14 west, 53, 80, 90, and 140 east are, or will be, equipped with first experimental channels using 12 GHz technology.

SPACE Shuttle flight video is now available on RCA F2R bird; previous coverage has been on F1R and F4.

FCC investigators determining that interference to WOR uplink signal late in October was deliberate. WOR common carrier, Eastern Microwave had announced they would scramble WOR signal "by March 1st or as soon thereafter as affiliates have descramblers in place." Eastern will use M/A-Com Videocipher system.

Next Ariane launches scheduled for TV interests: February 14th for second Brasilsat bird plus G-star 2; Approximately June 1st for ECS-4 replacement for lost ECS-3 plus Spacenet 4 or Australian Aussat 3.

SUPER STATION (WTBS) is locked in court battle that will have potential major impact on how super stations may scramble. Case involves whether any change in original as-broadcast TV signal consti-

tutes change for copyright payment purposes. Copyright law allows common carriers to only repeat or retransmit signal as received, not modify signal. If adding scrambling is considered by courts to change original signal content or scope, common carrier would become liable for copyright (use) payments. Big bucks are involved and common carriers don't want decision to go against them.

CHINESE launch vehicles, called Long March, will be available for use by other nations by 1988 according to Chinese officials. China plans to launch one satellite a year on their own for the next three years including first domestic satellite package this summer.

INDIA will use Ford Aerospace again to provide fourth Indian domestic satellite. No launch date has been set for Insat 1D.

FASTEST growing satellite space segment is across Pacific according to studies, with 20% growth per year. Primary reason is heavy trading between Japan and nations throughout region as well as into North America.

SHOWTIME/The Movie Channel set to start test of scrambling on normal service transponders (Galaxy 1 and Satcom F3R) middle of January. Both services plan to be into fulltime scrambling of all four transponders by May.

Scrambling plan dateline:

January 15: Four HBO and Cinemax channels due to be scrambled fulltime; Showtime/The Movie Channel due to start intermittent scrambling.

March 1: WOR scheduled for fulltime scheduling (unlikely that soon).

May 1: Showtime/The Movie Channel scheduled to begin fulltime scrambling.

June 1: CNN and CNN-2 scheduled to begin intermittent scrambling.

1986: USA Network, CBN, ESPN, MTV, VH-1, Nickelodeon.

HARRODS Department Store, London, went through Christmas season offering 5 foot Ku-band TVRO for \$1,700.

GI/JERROLD has closed down plants in Tucson and Toronto as part of reorganization. Satellite TV activities were conducted at both locations.

RAI UNO, Italian national network available via ECS satellite, is now being carried by Zurich (Switzerland) cable system.

US news chiefs interested in acquiring spy-in-sky satellite service for use by programmers. Concept is that present military and natural resource satellites are capable of resolving objects down to 10 meters in size from altitude of several hundred miles. News organization would like to tap that resource to allow use of such photo images in news broadcasts. National security questions are involved in decision.

NCTA uncertain whether M/A-Com will return check, reportedly for \$10,000, sent to scrambling firm back when NCTA was interested in funding cooperative venture for cable programmers. Check was apparently to cover deposit for scrambling uplink control system.

MTV/VH-1 and Nickelodeon will be scrambled by July 1 using M/A-Com scrambling package according to announcement.

FILMNET, Belgium firm supplying movies via satellite in Europe, wants to go multilingual and offer all movies using separate audio subcarriers in Danish, Swedish, French, Dutch, German, and English.

CNN got stuck with conditions attached to FCC approval allowing CNN to receive Gorizont programming direct in Atlanta from 14 west Russian bird. Approval was for only six months, requires detailed reporting to FCC of uses and results of experiment. Long term use is not guaranteed.

SPACE, on counterattack in Washington before House committee holding hearings on television copyright issues, charged cable interests are seeking to control distribution of programming outside of their cable marketplace. SPACE suggests Congress revisit current copyright laws to make it more difficult for cable to control program distribution through competitive TVRO marketplace.

NEXT big industry trade shows February 19-21 in Las Vegas.

how the buttonhook feed was tied down and I suspect it was not. Very sloppy installation. You will notice that the feed plus electronics is missing. I don't think it left willingly. I suspect the guy who originally installed the feed forgot to attach the thing beyond finger tight. The feed, un-guyed and swinging in the hurricane winds, probably ended up being shot putted into the next county.

Then there is a photo of a nameless spun metal dish. I suspect the plastic is on the roof because the house lost some shingles in the storm. Asphalt shingles normally don't start coming off until the winds reach over 80 miles per hour but that could be a few miles higher or lower depending upon the age of the shingles and the composition of the materials. I am impressed that the pole mount did not give way. The dish, well....

I have been preaching for years that the outer rim of any dish, whether spun or in sections, needs to be strong enough to support all of the inner section. The metal in this dish looks extremely thin and I suspect that the rolled outer rim was rolled more for decoration than strength. The idea with rolling the rim is that you force the metal to travel in a new, different direction so that the stresses on the surface are diverted. If the rolling is too small or too tight, to save metal, the rolling may actually decrease rather than increase the rim strength. I suspect that is what happened here. Somebody said "Let's roll the rim to make it look good," rather than, "Let's roll the rim to give it added strength."

If you can pick up a spun metal dish and it flexes when you shake it like a frisbee in the teeth of a dog, you probably don't want that dish out there with your dealership name on it. If the rim of the dish is rolled only part way rather than totally back on itself, you probably don't want it. If you can take the palm of your hand and press in on a spun dish and the metal gives (pops) in, and does not pop back, well....

Finally, there is the photo of the (Odom, of course) fiberglass four-piece dish. The dish, as best as we can tell from the photo, survived the storm. The mount bent over at an angle which a protractor stuck on the side measures at 10 degrees.

This was a survivor, but not a working survivor. Read our extensive report on the Kate damage on Provo to discover what a working survivor looks like. The pipe should not have bent over. This tells me that the pipe was simply not strong enough to take the wind load. People who insist on using the wrong schedule of pipe, and who insist on using 3-1/2 inch pipe when they should be using 5 inch pipe are not doing themselves or their customers any favors.

Photographs of hurricane damage are interesting to study and they serve to remind us all that the forces of nature are working against a satellite installation at all times. Dealers who cut corners to save a few bucks or a few minutes may be extremely shortsighted about their own business future. Good antennas will take a beating but only if good an-

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Odom four piece survived; electronics 'blew off' front of dish and pipe bent over with 980 pounds of concrete in the base hole.

ennas are installed by people who use good installation techniques. As always, a chain is only as strong as the weakest link in the system.

Cable's Big Move

I wish I had enough confidence in cable's overall leadership to believe that everything significant happening in the cable scrambling field since say one year ago had been carefully thought out and planned. I detest sloppy planning.

A quick review. First, HBO says they will scramble and they announce M/A-Com as their scrambling supplier. HBO also says they will front a scrambling consortium, acting as agent for all of the other programmers. That surprises many of the programmers, some of whom tell me that HBO had not broached the subject to them. HBO acts like they own the patent on scrambling and their 'devil be damned' attitude angers some of the other cable programmers.

Then HBO says they won't represent other programmers after all. That happens almost concurrently with several studies being published which reveal as many as 4 out of 10 new TVROs are going into cable franchised areas. The latter fact upsets many cable people who until that revelation have been smugly ignoring the inroads of TVRO. Now cable people begin to forget their differences and start to rally about the cable flag. There is one problem; nobody steps forward to carry the flag.

Not to worry; the cable trade association, NCTA, says they will carry the flag. Nobody really thinks they are capable of such a duty but everyone salutes anyhow. Now more and more cable programmers are announcing their scrambling intentions and services such as CNN

and ESPN play for maximum headlines by announcing an interim charge for TVRO. The TVRO industry cries foul and steps up a campaign to get Congress into the act.

Cable leaders began to put pressure on malcontents like Showtime and within a matter of weeks this past fall it became clear that if you are a cable programmer, the easiest way to get your industry mad at you is not to salute the scrambling flag. Showtime now salutes and all is forgiven.

TVRO is getting more and more concerned about the reality of scrambling. Through the fall, it became evident that very few real cable programmers will avoid scrambling. TVRO now focuses on the issue of pricing since the larger issue of scrambling begins to look like a lost cause. And in spite of significant Congressional inroads by TVRO, the strength of cable's Congressional pull is becoming more and more apparent.

Which brings us almost to the present.

The issue is price. I think there has been a master plan here all along. And I think a handful of cable people, such as TCI's John Sie, have been calling the shots from at least last spring.

1) HBO agrees to be the bad guys. They scramble first, they announce their rates first. Point-men always get arrows in their hind ends; HBO agrees to take the arrows.

2) Others, such as CNN and ESPN, fall unwittingly into the HBO set trap. If HBO is worth \$12.95 a month, why shouldn't CNN be worth \$2.00 a month, or ESPN be worth \$1.80 a month? Why not?

3) SPACE screams, on cue, about high prices. Congress hears from tens of thousands of people about high prices. Congress looks upon the basic issue of scrambling as a policy problem. If there are several different scrambling systems to be used, and TVRO viewers will need two or more different de-scramblers to access the scrambled signals, that is a policy matter. Congress can handle that.

4) But, if only one scrambling technique is being used the real question boils down to pricing; that's an entirely different issue. Hey, cable is ready for that one, too. It is just a matter of timing.

5) In the wings, a master plan created by master cable marketer John Sie is being fine tuned. Let TVRO scream about pricing. Let TVRO get Congress and everyone else all worked up over the suggested \$12.95 a month charge for HBO or the \$25 a year charge for CNN. Then watch John Sie ride in on his white TCI horse to pull the rug out from under TVRO and SPACE. How?

Sie planned to sell HBO for far less than \$12.95 a month all along. He planned to offer HBO plus Showtime plus Cinemax, and so on, plus every basic service such as WOR and CNN and ESPN (et al) for between \$25.00 and \$30.00 a month, from the very beginning. But Sie is a very bright man; he knew that if they announced such low rates to begin with, TVRO would scream and no matter what the price, his rates would seem high. So let HBO and the others scare the crap out of TVRO and let Congress think the rates might be too high. Then come along on the white horse at the end and save the day. For cable.

Sie's TCI can do it. With some 3,000,000 basic cable subscribers spread out over the largest cable multiple system ownership organization in the business, Sie is in a position to offer TVRO subscribers an entire package of services for a very reasonable monthly rate. His

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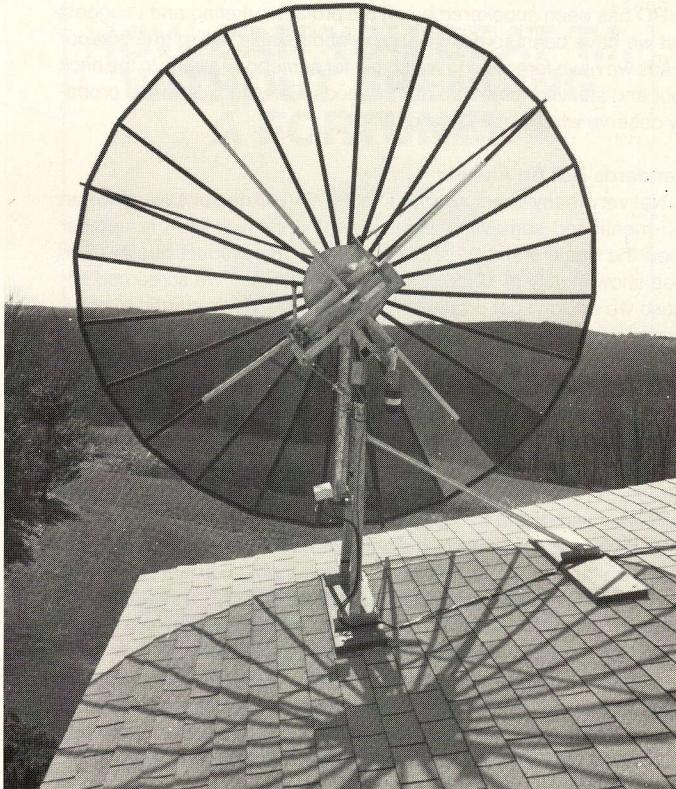
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hundreds of cable systems are in a position to handle marketing, sales, and even hardware distribution if they wish. And they wish.

How surprised would you be to learn that TCI has already been engaged in talks with Far Eastern TVRO suppliers, firms who would provide complete TVRO systems for TCI to lease or sell to home owners through the local or regional TCI cable systems? Don't be surprised. Think in terms of 100,000 TCI financed systems per year for 1986 alone, distributed via TCI operated or TCI franchised cable system offices or cable stores.

It is all timing. The TVRO scrambling program has been an emotional, seemingly uncoordinated sequence of events for more than a year. For the TCI/Sie plan to fly, it has to be a rescue mission all along. It had to come along close to the wire (ie, just when HBO really began scrambling) and it had to look so much better than the alternatives that they could count on getting lots of good press, receiving letters of commendation, and the gratitude of both the cable and TVRO industries for their innovation.

Best of all, if the fever pitched emotions could be kept running, the plan need not cost TCI very much (if anything) to implement. For example: keep the cable operators all riled up about TVRO inroads in the marketplace and the cable operators, like sheep being led to slaughter, would gladly agree to purchase their own descramblers for basic services such as WOR or ESPN. Keep the TVRO people so confused on who was the leader in all of this, and who was carrying the cable flag, and they could slide in the side door unnoticed until it was too late to object. Keep Congress distracted on the pricing question so that when TCI announces its own (lower) pricing schedule, Congress will acclaim "Hey, that's a fair price; there is no problem here and we don't have to act after all!" Of course, Congress doesn't want to act on this, really, at all. No matter which way a Congressman goes on this issue, he loses either votes or money or both. An arbitrated solution suits Congress just fine, thank you.

I don't like conspiracy theories. I don't think there has been a conspiracy here. But I do see plenty of evidence that suggests to me that my old acquaintance John Sie and some of the really bright people at ATC and HBO have at least put their heads together on this one. I think TVRO has been snookered by an old pro at marketing and I suggest that we have been so busy worrying about cable felling trees on our heads we have forgotten to watch out for somebody sliding in the back door and stealing the whole damn woods. Good job, John; we probably deserve what we are now getting.

Standards Not An Answer

Not very many years ago the average TVRO dealer saw red when you mentioned something about equipment reliability. I remember when the dealers started shouting about poor product quality (San Jose show in July of 1980). Back in the first days, we screamed because we couldn't get product. Then when we finally started to get it, we switched to screaming about the poor quality we were getting.

Somewhere along the way, somebody got the idea that if we somehow had standards, all of our equipment problems would go away. I never bought that theory and at one point while I was still on the SPACE board, I argued strenuously against standards which were going to be put together by people who manufacture equipment. I had a surprising ally in those debates, Andy Hatfield of Avcom (back when Andy was also on the SPACE board).

Andy argues that if we had standards everyone would build to the adopted standards and that could curtail innovation and creativity. Never one for mediocrity, Andy worried that if there were standard performance criteria for receivers or LNAs, for example, that would enable offshore firms such as those in Japan to march in and take over the marketplace. Anyone else, other than Clyde Washburn, making those arguments would have been looked upon with great suspicion. But Avcom products have always been at the top of the ladder for product quality so it was difficult to argue against a man who built nothing but the best and who was not in favor of standards.

Alas, we now have standards. We have a set of guidelines which SPACE has pulled together which purport to protect the poor hapless dealer from inferior actuators, noisy LNAs, receivers that blow out fuses and antennas which warp in modest winds. But do they do any of these things, these standards?

No, they do not. And I want to explain to you just what the new SPACE standards really mean so you are not lulled into a false sense of security when you begin to notice product advertising in the months to come which make claims for minimum performance standards based upon the SPACE industry standards.

The standards deal not with performance but rather with labeling and testing. Here's how they work:

- 1) A manufacturer will submit his piece of equipment to a testing lab. The testing lab will agree to conduct the appropriate tests to see if the unit submitted meets, exceeds or fails the standards.
- 2) The standards specify certain minimum operating parameters for different types of equipment. For example, the LNA standards require certain interfacing voltage and connections at the receiver proper. The voltage from the receiver to the LNA (LNB) shall be a minimum of 17.1 volts (DC) and a maximum of 24 volts. A maximum current for the LNA is specified and an operating temperature range for the power supply is specified.
- 3) The testing lab (several are getting ready to get into this new business, you can be sure) will determine whether the receiver's LNA power supply fits these criteria. No more, no less.

Perhaps there is a high AC content (ripple) in the DC voltage for the LNA. That would cause hum bars in the LNA processed signals. There is no specification for that. Perhaps a poorly designed connector is used to couple the DC to the LNA. There is no specification for that. Maybe there is a fast rise-time spike emitted by the power supply, capable of zapping an LNA under certain power-up conditions. There is no specification for that.

The point is, without going through every piece of equipment and every set of individual component specifications, the standards committee has done the best job it could without stepping on the toes of any manufacturer. Yes, the people serving on the committees were manufacturers. No, there was not very much dealer (nor distributor) input on these committees. That's not to fault the committee groups nor the job they did; they did the best job they could given the general lack of interest and enthusiasm from the industry.

Basically, the standards are an attempt to smooth out the rough edges in product design. The concept is that every manufacturer will submit every product to an independent testing lab so they can say in their advertising or on their product data sheets "Meets or Exceeds SPACE Industry Standards." What you as a dealer have to be wary of is the very big difference between SPACE Industry Standards and anything approaching a guarantee of product superiority. The standards will cull out only those products that are radically different in design, possibly those with user safety concerns, and products created by people who refuse to learn how to spell TVRO before they rush into production with some wild product design.

Perhaps the most important thing the standards will do is force uniform product labeling and something approaching uniform product color coding for cabling. And that's not all bad. In the future, with standardized products, every mechanical servo-type feed will have a red wire for the voltage, a black wire for ground, and a white wire for the pulse. One small step for TVRO dealers if not a large step for mankind.

Then to complete the uniform labeling in our example, all receivers will be labeled ground, pulse, and + voltage. You will teach your installers:

- Ground = black
- (+) Voltage = red
- Pulse = white

Every feed will work with every receiver happily ever after.

Standardization will make life less complex, reduce the opportunity for installer error or mis-interpretation, and probably ultimately reduce the amount of equipment flowing back to manufacturers for warranty repair. Standards will not get rid of poor equipment, will not correct actuators that refuse to play, will not fix fittings that take in water, and will not descramble HBO. But they are here and, in their proper perspective, will be a positive force for all of the industry in 1986.

Interference With Uplinks

Last May there was a strange, yet unexplained case of uplink interference with The Movie Channel. It lasted some 10 hours or so and while this clandestine uplink transmitter was running, nobody could use The Movie Channel, cable or non-cable. Taken alone, it was an isolated incident.

More recently, Showtime (and again The Movie Channel), and WOR have had isolated instances of uplink interference. The WOR interference was especially notable because it happened only days after a magazine article in *STV Magazine* suggested with tongue-in-cheek that scrambling could be shut down or even defeated by someone who purposefully interfered with an uplink signal. When I read the *STV* piece, I laughed myself silly because in the January issue of *Home Satellite TV*, in my regular column there, I recall with some detail how way back in 1977 or so I sat in a bar with a couple of cable/satellite engineers and we sketched out on bar napkins how to not only jam a satellite but actually steal a satellite away from its rightful owner, say RCA. *STV* beat me to the newsstand with their recent story and the people who uplink WOR (Eastern Microwave) didn't think the *STV* piece was funny at all.

Jamming an uplink is serious business. First of all, it could be an FCC fineable offense. The FCC could extract as much as \$10,000 from persons caught jamming an uplink. The same person or persons

could be stuck away in a federal pen for several years in addition to being slapped with a fine. Of course, they have to catch you....

Eastern Microwave went into near hysteria when they lost parts of a couple of days (late in October) to an uplink jammer. They filed a complaint with the FCC, cited the *STV Magazine* article, and some cable people called *STV* and editor Chris Schultheiss everything from radical perverts to fomentors of revolution. I laughed some more when I read or heard all of this. The story even gobbed up a full page in the prestigious magazine *Broadcasting*. They mis-quoted Chris, I suspect, because he came out looking like a guy who would sell Molotov Cocktails to kindergarten kids who had lost their milk privileges.

Here's what it is all about.

A satellite is totally unprotected. There are two ways to get to a satellite: ICBMs and jamming. ICBMs make no sense because they are expensive, and detectable the instant they leave the launch pad, and can be traced right back to their source. Jamming, on the other hand, cannot be traced. Period. A 10 foot dish and a 100 watt uplink transmitter can shut down HBO or any other programmer. Or you could use a 20 foot dish and a 25 watt transmitter. I happen to like the 20 foot/25 watt approach since the jamming signal will focus better on a single satellite and I can buy a 25 watt 6 GHz uplink transmitter off the shelf from M/A-Com for just a couple of thousand bucks. I can find one on the surplus market for a few hundred dollars. Of course I wouldn't do such a thing, but if I wanted to, it would be about as complicated as firing up a CB set. I could order a 6 GHz feed from Seavey Engineering and I'd be in business.

I figure it this way. The cable people need to run scared. They need to know that if they anger enough people, there is some retaliatory action which they cannot handle. Sure, they can complain to the FCC

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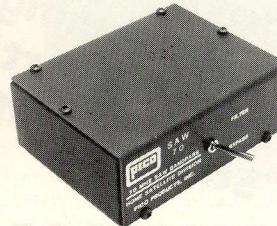
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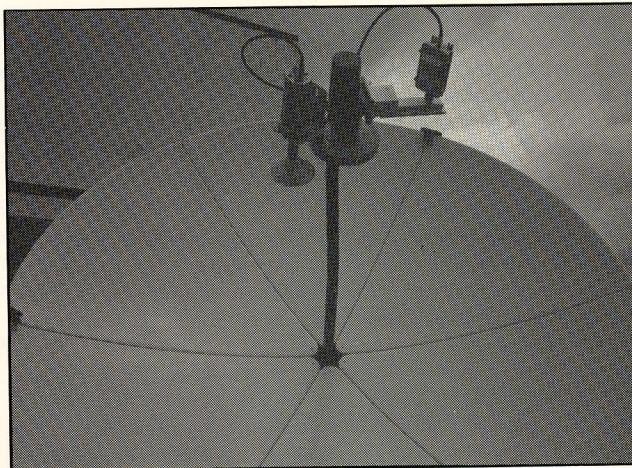
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and they can threaten law suits and jail and big fines. But they are going to have to catch the guy or gal doing it first. And with today's technology, and today's hardware, there is virtually no way they are going to find a fellow uplinking from a valley in South Dakota or a desert in Arizona. And if the jammer was in Canada or Mexico or the Caribbean, well...he or she could jam at will for as long as his TWTA held up.

A transponder rents for \$67,000 these days, full time, for a month. But to HBO, it is worth 14,000,000 x \$4.00 a month or \$56,000,000. That's what HBO takes in each month for their programming. If you wanted to get HBO's attention, if you wanted to force them to stop scrambling for awhile, just crank up an uplink jammer and shut them down for say a week. After they lost \$14,000,000 in a week, I'll bet they would be willing to agree to almost anything.

Maybe those jamming incidents of Showtime, The Movie Channel and WOR were accidents. Maybe nobody has it in for the uplinkers and maybe nobody will ever have uplink interference again. Maybe, but I doubt it. I figure somebody is testing the waters, getting the bugs out of their uplink transmitter and probably busy in a garage in Petaluma building four more uplink jammer rigs.

I think the cable folks opened this Pandora's Box. And I figure they are going to have to live with it or find some way to accommodate those fringe loonies who might engage in such an activity. And I hope the cable folks realize how totally vulnerable they are in this one before jamming becomes a way of life for everyone using satellites. There are plenty of people out there who feel righteous indignation over the way scrambling is going. Nothing that happens in the coming months is going to surprise me.



Interim approach to handling dual-band feeds has been to stick a Ku-band feed plus LNB on the side of an existing C-band feed and electronics. Not good; we need something far better to make true dual band systems saleable to consumer users.

Ku Feeds

I've played around with a couple of dozen Ku-band systems now. We have had a dozen or more down on Provo for testing and I try to stop and inspect any new ones I see at trade show demos when the opportunity arises. I have not been impressed.

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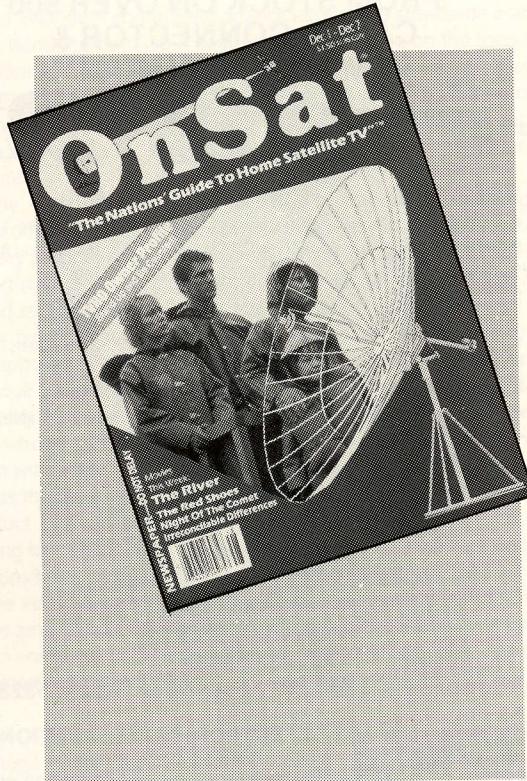
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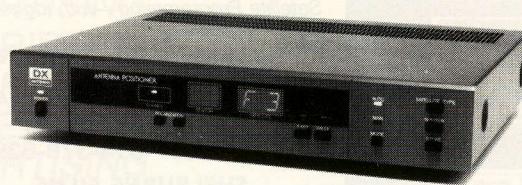
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Several companies are trying to get by with sticking Ku-band feeds on the side of or even inside of the scalar rings of the C-band feeds. This places the Ku-band feed away from the focal point of the dish and that means the Ku-band signals are knocked down or reduced by as much as 5 dB in a typical installation simply because the feed is not where the energy is concentrated.

RCA's Ku 1 and 2 birds, the first really interesting Ku-band services for North America, will work with four foot size dishes quite acceptably provided the dishes are reasonably accurate for 12 GHz service. By sticking the feed off to the side, knocking down the 12 GHz service by 5 dB or so, you need a dish 5 dB larger than four feet. That means a 12 foot dish if, in fact, the dish surface is any good as 12 GHz. Many of the C-band dish surfaces are very poor at Ku and you almost have to do individual testing to determine which dish will work and which will not at Ku.



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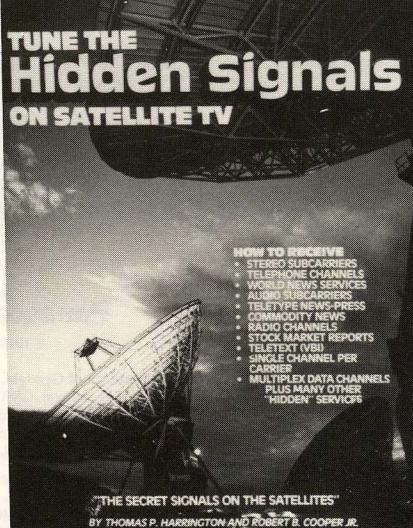
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Chaparral has been promising a full line of Ku-band products for more than a year now. They have also shown us some dual band systems but these systems use the C-band scalar as a support mechanism for an inset-placed Ku-band scalar, and the end result is the Ku-band feed is once again away from the dish focal point. Luxor showed me a design for a single waveguide mouth at the front and 4 GHz plus 12 GHz waveguide (flange) openings at the rear, nearly one year ago. Their concept was that you should be able to place a 12 GHz and a 4 GHz LNB on separate mounting flanges back along the side of the waveguide piece and use the same scalar loaded mouth to accept signals on both bands. That seemed like the best approach to me if you could sort out the matching and feed patterns required.

Gene Augustin, the man who now claims that it was he and not Taylor Howard who created the first rotating probe 4 GHz feed (ie. Polarotor™), has been showing off his own version of such a feed (4 and 12 GHz, with rotating probes for polarization switching) for a couple of weeks now. I expect we will see the Augustin designed probe as a significant part of a new package system from a major TVRO system supplier in Las Vegas next month.

The Ku-band service is never going to amount to much until we get the hardware portion straight. Back when C-band was starting, people put up with poorly designed feeds, bad cables, and serious product flaws because we didn't know any better and we didn't have any alternatives. Now that we have the design flaws worked out at C-band, there is no excuse why we can't have the same bells and whistles on 12 GHz as well. There are some definite marketing opportunities at 12 GHz because there are some serious product flaws and some product needs still to be met. I hope there will be intense R and D interest in 12 GHz over the next six months because we need it to make us ready as an industry to deal with the dual band systems which are sure to be in greater and greater demand as 1986 moves on.

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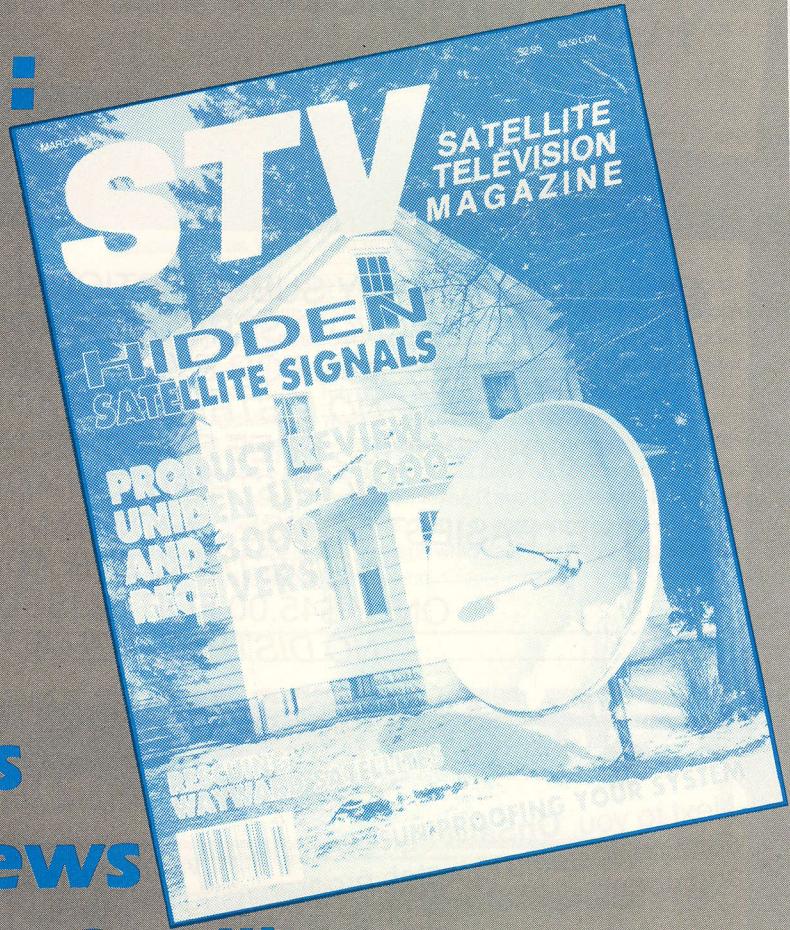
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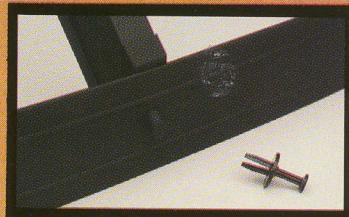
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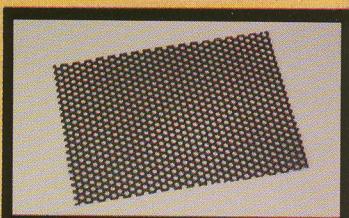
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2



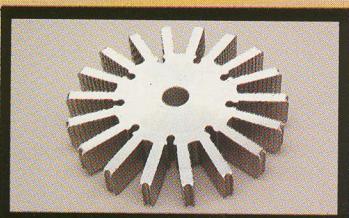
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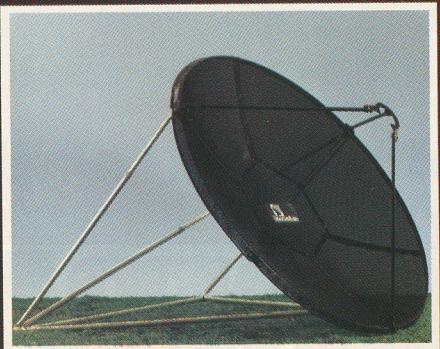
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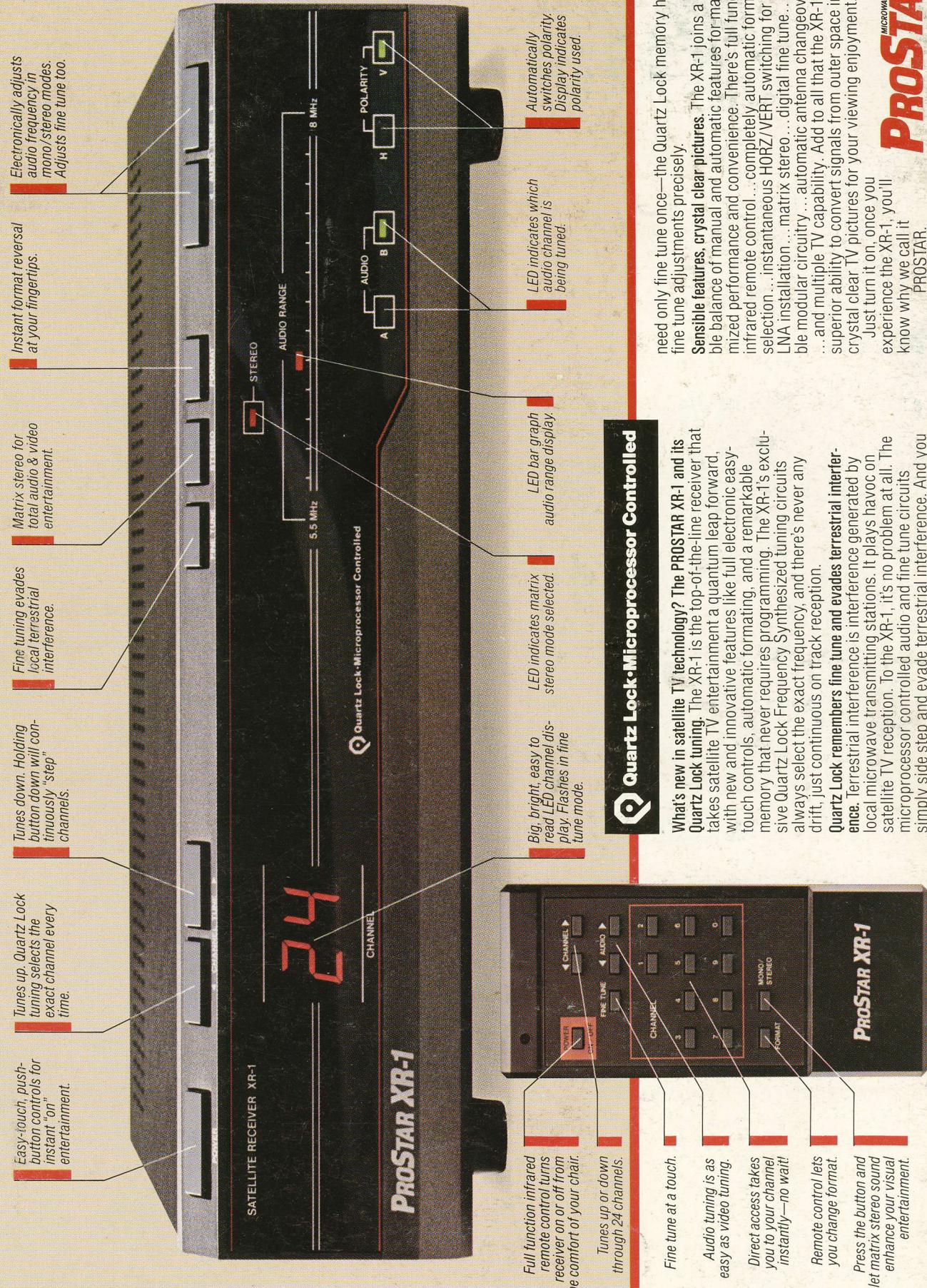
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